Practical Surgery

Diagnostic, Therapeutic and Operative

By

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With Numerous Illustrations

TO

THE ADVOCATES OF LIBERAL MEDICINE

IN AMERICA

THIS VOLUME IS RESPECTFULLY DEDICATED

BY THE AUTHOR

Preface

In writing this book it has been the aim of the author to make it practical; and to do this unnecessary time and space have not been given to long dissertations on surgical diseases, and little, if anything, said along the line of treatment of morbid states. The surgical subjects receiving attention throughout the work are both general and special, and the treatment suggested, both medical and surgical, is such as the author has found to be effectual in a continuous practice, both in hospital and private service, extending over a period of thirty years. I am mindful of the fact that in a single volume like this the description and treatment of some common diseases and injuries, of necessity, must be somewhat brief; but there are numerous surgical works that the surgeon may have access to that will discuss these features in a more exhaustive manner. They each have their sphere of usefulness, and are indispensable as works of reference.

An effort has been made throughout the work to exclude consideration of surgical topics that are purely technical, and of no practical value along the line of successfully treating the abnormal conditions. When suggesting remedial treatment of morbid affections, medicinal agents have been named, and in connection the symptoms, or the reason for giving the remedies, have been pointed out, as the author is a firm believer in prescribing medicines in accordance with the specific indications for the same.

Of the numerous subjects considered in the book, frequent reference has been made to recent surgical productions of such able surgeons as Professors McGrath, Gant, Brewer, Stimson, Young, and the writings of that matchless surgeon, Prof. A. Jackson Howe; for no author, however extensive his experience in surgical work, could write a creditable volume, even of this size, and rely entirely upon his own observations in

the diagnosis and treatment of some surgical diseases, that are in a way obscure, and accidents that are seldom met with.

The illustrations, while not numerous, have been carefully selected from various sources, to make plain what the writer has said in the text, and full credit for the same has been given the authors, when known.

That the subject matter shows shortcomings along some lines I have no doubt, as the book was written during a period of busy professional life, and under such conditions mistakes and omissions are unavoidable.

The author is greatly indebted to Dr. Edward J. Farnum, of Chicago, for numerous illustrations used in the text, and other valuable service rendered in arranging the subject matter.

<div align="center">B. ROSWELL HUBBARD, M. D.</div>

Los Angeles, California.

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PART ONE

General Subjects

PATHOLOGICAL CONDITIONS

The term pathology signifies the sum of what we know of diseased conditions. General pathology has reference to the processes which may occur in diseased states of the several organs of the body. Surgical pathology deals with such morbid conditions as require a resort to surgical measures for relief.

An individual has health when all the vital operations of the body are performed naturally and painlessly, and to maintain this state of body certain requirements must be complied with, chief of which are the supplying of fresh air, nutritious food, exercise, refreshing sleep, and suitable clothing to protect the body from sudden changes of the weather. It is from this standard of health that we measure the variations which are denominated disease.

We can know but little of morbid conditions until a knowledge of the healthy action of the body is first attained, and to gain this the student of medicine and surgery will have to master the subject of physiology, which treats of the functions of the body.

By a wise provision of nature the human system is supplied with a certain amount of conservative force to combat diseased conditions; but, occasionally, the natural forces of the system are overwhelmed with morbid matter, as when it becomes shocked with the poison of some infectious disease like syphilis or small pox. In such events nature should be aided by the administration of such medicines as the individual case may require.

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It would be somewhat difficult to draw a sharp discriminating line between diseases that are considered medical and those that are looked upon as purely surgical, although attempts have been made by pathologists to so divide them. Howe says in his surgery that "It is difficult to distinguish between the febrile symptoms produced by the inception of animal exhalations which arise from crowded and unventilated apartments, and those induced by the absorption of putrid fluids from a wound; or to make rational discriminations in the treatment of the two varieties of blood poisoning.

"The initiative chill, the cardiac excitement, the perverted secretions and the cerebral disturbance, indicate similar morbid conditions in both kinds of poisoning, and each calls for identical therapeutic measures.

"To be sure, surgical diseases, etymologically considered, are those in which the hands are used in the management of them, or some kind of manipulation is applied, as in the use of instruments. Such diseases are mostly of the extremities and of the external parts of the body.

"Medical diseases are more especially confined to the viscera, and are therefore obscure in their nature, and more amenable to medicine than to manipulation. However, the peritonitis which follows parturition is practically like that which attends strangulated hernia; and the pneumonia succeeding exposure to a cold current of air is not substantially unlike that which is the sequela of a bullet in the lung.

"It has been convenient to assign a certain class of diseases to the province of the physician, and a certain other class to that of the surgeon, but the latter can legitimately lay claim to those only which require manipulation in their management. However, he is not rigidly restricted to these; he medicates as well as manipulates.

"Besides, every experienced physician practices more or less of surgery; he applies poultices, plasters and liniments; and in isolated locations he is compelled to treat fractures and to perform important surgical operations. Under such circumstances he executes a mixed practice, and claims to be a physician and surgeon. On the other hand, very few professional men in this country practice surgery exclusively. This is as it should be, for

many surgical diseases require as high a degree of skill in the medication of them as is possessed by the physician who lays no claim to surgical experience."

Disease wherever found is a departure from the normal standard of health, and for the sake of convenience of description is classified into three stages; acute, where the disease has a sudden onset and runs a short course; subacute, a condition of disease where the morbid state has a tendency to linger but the symptoms are not very active; and the chronic form where the disease is of long duration with no tendency to yield to the efforts of nature to heal.

When only a portion of the system is morbidly affected we speak of the disease as being local, but when the whole system is sorely impressed we describe the disease as general. A disease may be local at the outset, yet become general within a few hours, days or weeks, through the continuity of structure.

Morbid conditions of the system frequently take place as the result of disease, or of the fluids of the body becoming saturated with a poison arising from the presence of certain microbes, thus a cachectic state of the body may exist resulting from a depraved condition of nutrition, and bacterial poison will produce a condition of general intoxication. An individual subject to certain diseases either by inheritance or acquiring the same is living in a state of diathesis.

Dyscrasia is a term used to designate a depraved or altered state of the blood.

Disease is surgically divided into two classes, the anatomic and topographic, according to the location in the body of the disease and the structure involved. If a disease be due to absorption of septic matter it is said to be infectious; and traumatic when due to injury. When a disease originates from independent causes within the system it is said to be idiopathic. Diseases are sometimes spoken of as physiologic as may be noted when the vascular, nervous, or muscular systems are the seat of morbid changes. When it is plainly evident that the individual is sick, but the wrong of structure or function is such that the seat of physical disturbance cannot be readily determined, it is said that the developing malady is obscure or latent.

Symptoms are but the language of disease and disease is

the result of functional disturbance. Determining the nature of the disease by the symptoms present is termed **diagnosis** and forming an opinion as to how a disease will terminate by the symptomatic indications, is summed up in the term **prognosis.**

We speak of symptoms as being **subjective,** as when they are noted and interpreted by the patient himself; **objective** when the salient symptoms are observable to the physician and others; **pathognomonic** when the nature of any special disease can be readily determined by the presenting symptoms.

To determine the real nature of a disease in obscure cases a diagnosis is often arrived at by **exclusion,** that is the consideration of disease, the established symptoms of which are, in a measure, similar to those presented for examination in a given case. As other aids to diagnosis we have that of **touch,** termed palpation; **hearing,** percussion and auscultation; **sight,** inspection; all of which are termed **physical** aids. To determine the location of the disease in the system is termed **topographical,** and the real nature of the existing ailment as **nosological.**

Infectious diseases are those produced by micro-organisms; they may run a rapid course, or develop morbid conditions days or weeks after the infection has entered the system. The period between the time that the disease-producing germs enter the system and the appearance of the manifestations of disease is called **incubation.** During this period there are usually no symptoms noted of the impending crisis.

It is of the greatest importance that the surgeon or physician be a careful observer of pathological symptoms as by this means alone can he interpret the language of disease and be able to prescribe an intelligent line of treatment.

IMMUNITY

Some persons are so constituted that they can resist the onslaught of the most virulent of infectious diseases. This inherent power is called **immunity.** Those persons who have not this resisting power and who readily yield to the influence of infectious disease are said to be **susceptible** to morbid conditions of the body.

Immunity from disease may be hereditary or acquired; when it is due to heredity the inherent power is transferred from parent to progeny.

If acquired, immunity is brought about by producing changes within the body by the introduction of antitoxins to the extent that susceptibility to disease is greatly diminished.

As a rule the system is immune from secondary attacks of many of the acute infectious diseases. In this connection may be mentioned such common ailments as measles, chicken pox, scarlet fever, mumps, small pox, and whooping cough.

There are, however, several infectious maladies from which the system is liable to subsequent attacks even when the first was extremely severe in character.

Erysipelas is a disease of this character, and so is diphtheria, typhoid and typhus fever, and German measles. It is claimed for erysipelas that once it severely attacks the system a person is rendered more susceptible to subsequent infection with the streptococci. A severe attack of diphtheria renders a patient immune from a subsequent attack for a period of a month to six weeks; scarlatina from three to six months and the period of protection after typhoid fever and rötheln varies with the individual.

The theories of immunity are many, the originator of each claiming that the changes wrought in the body after the introduction of the special substance renders the system immune to a recurrence of the disease in most cases. Brewer groups the different theories into two classes, humoral and cellular; the former attributing immunity to extracellular fluids of the body, while the latter assumes that the body cells play an important role in the resistant power. The same author divides the humoral products into the antitoxins, lysins, apsonins, precipitins, and agglutinins. Describing the action of antitoxins in the body he further states that under certain conditions they are both protective and curative because "they unite with the toxin of the kind which called it forth and prevent it from causing disease by union of the body cells with toxin."

Opsonins are substances in the serum which result after introduction into the body of bacteria under favorable conditions, and act by forming a union with these cellular bodies in such

a way that they may be more readily engulfed by phagocytic leucocytes.

"Lysins result from the introduction into the body of bacteria under suitable conditions, and act by dissolving or destroying the cellular bodies of a type which called forth their production."

"Precipitins are substances in the blood-serum which result from the injection into the body of various protein substances of animal, vegetable, or bacterial nature, having the power of forming a precipitate when mingled with these substances."

"Agglutinins, under similar circumstances, are capable of drawing together into clumps bacteria and other cellular bodies which have been introduced into the serum of animals."

"As methods of determining the type of infection which the body is undergoing, however, these phenomena, on account of their specific action, are great diagnostic aids. The one best known at the present time is the agglutination of typhoid bacilli in the presence of the serum of typhoid fever patients, known as the Widal test."

Speaking of the "sero-therapeutic" measures adopted to overcome the deleterious effects of bacterial infection, Brewer divides them into "curative injections by active immunization, and passive immunization," and says of the former that it is secured through the action in the body of bacteria whose virulence has been reduced but not rendered altogether inert. Common examples are bacterial suspensions, recently designated as vaccines, of staphylococci, streptococci, gonococci, colon bacilli and other organisms. The author cites the researches of Wright, who recommends the use of the opsonic index to regulate the size and intervals of their dosage.

"Passive immunity is secured by the direct mingling of the body fluids from an individual already immunized with those of the individual to be protected; such fluids are the antitoxic sera—represented by diphtheria and tetanus antitoxins and others and antibacterial sera to which group belong the sera of typhoid, cholera, plague, dysentery, etc."

"These methods may be applied not only for curative purposes, but also to prevent the effects of future infections. Protective passive immunization may thus be obtained for compara-

tively short periods of time by the use of diphtheria and tetanus antitoxins where infection by the corresponding organism is threatened."

"Of the agencies producing protective active immunization, the most familiar are the vaccine of Jenner producing immunity to smallpox, and the antirabies vaccine of Pasteur. In both of these cases, as well as in some successful experiments in tuberculosis immunity, immunization is secured through the injection of long lived attenuated organisms. The use of dead organisms as vaccines for the production of active immunity has recently met with a certain degree of success in protection against infection of typhoid fever, plague, and some of the pyogenic organisms. The protection afforded by active immunization is generally of longer duration than that afforded by passive immunization."

INFLAMMATION

In a volume of this size devoted to general surgical topics, only the salient points of some debatable subjects can be touched upon. Inflammation, its etiology, symptoms and treatment, will come under this head. If a part is inflamed it is said to be in a morbid state; that condition is one of heat, pain, redness, and swelling, with functional impairment of the part. This morbid state is really symptomatic, whatever may be the causes leading up to it, and before a plan of treatment can be outlined we should know something of the exciting phases of the morbid phenomena.

Inflammation is the result of an increased flow of blood to the part; cut off the circulation and inflammatory conditions can not exist.

The pathological condition may manifest itself by some local disturbance, or in a general way, when we speak of the wrong as constitutional; this phase of the disturbance is usually ushered in with a chill, followed by fever, thirst, rapid pulse, and general derangement of the functions of the system.

Local inflammation may result from numerous causes, as a sting, bite, cut, bruise, a boil or an ulcer, and other conditions of

like character. The inflammatory disturbance may be so active that suppuration may supervene; rigors, followed by fever, are not infrequently met with in this local circulatory disturbance. The morbid phase is extended from one part to another through the continuity of structure by means of blood vessels and lymphatics, and will terminate in one of three conditions: resolution, organization, or death of structure.

Pain resulting from inflammation is due to nerve pressure, caused by the exudation of plastic lymph in the cellular tissue; the denser the structure the more intense is the pain.

If new structure is formed by the inflammatory action, nourishment will be supplied it through the extension of adjacent blood vessels.

The treatment of inflammation will be local or general, depending on the character of the exciting cause; this being removed, the morbid state is likely to terminate in resolution; should the process continue, the inflamed structure is likely to eventuate in abscess formations.

Topical applications to the local disturbance are, in many instances, all sufficient. In many cases dilute witch-hazel, arnica, aconite, and tincture of opium, constitute excellent lotions, the alleviating effect of which is aided by fanning the part after the solutions have been applied.

The occasional use of pounded ice in a rubber bag is both cooling and comforting; as is the spray of ether in cases where it is applicable. If the inflamed part is accompanied with pain, much relief will result from the following mixture:

℞.
Carbonate of Potassium .... ℥ i
Tr. Opium .... ℥ vi
Camphor Water q. s. ....fl. O i

M. Sig.—Applications are made by wetting cloths, applying to the parts affected, and covering with cotton.

Should the inflammation result from infection, great reliance can be placed on the alkaline solution:

℞.
Biborate of Soda .... ℥ i
Salicylic Acid .... ℥ iii
Glycerine .... ℥ ii
Boiling Water q. s. ....fl. qt. j

M. Sig.—Wrap the part, when possible, in absorbent cotton, and keep it wet with the antiseptic mixture.

The range of usefulness for this alkaline antiseptic in inflammatory states, whether simple or infectious, in emergency practice is unlimited. It can be made in various strengths to meet conditional demands, and will be frequently referred to throughout this work when treating of septic and inflamed conditions of the system; hereafter it will be referred to as the alkaline antiseptic or solution.

In all inflammatory states, unless of minor degree, the general system needs attention; if it be profoundly impressed, rigors and fever resulting, the condition will call for frequent sponging of the body with soda water, to lessen the temperature. An occasional dose of bromide of soda (10 grains), in a wine glassful of water, or acetanilid in five-grain doses every three hours in excessively feverish states, is indicated, and will be comforting to the patient, especially should he be nervous and restless. In connection, should the tongue be coated with a moist, glutinous fur, give five-drop doses of sulphurous acid in a little water every three hours; or instead of this give the same sized dose of dilute muriatic acid if the tongue shows dark red and tends to dryness.

Echinacea or echifolta, the specific tincture, given in potent doses, is invaluable in septic conditions provoking inflammatory states; either is given in ten- to thirty-drop doses, well diluted in water, every two or three hours.

For superficial inflammations attended with itching, burning and stinging sensations (erysipelas presenting a marked example), no more efficient agent is at our command than Lloyd's Libradol spread over the affected area, and renewed morning and evening.

It is of great importance that the bowels be kept open, some one of the magnesia salts being employed for this purpose. Should the patient show a decided cachectic condition of body, in chronic states of the disease, before improvement can be expected, the morbid state of the system must be improved by the judicious administration of peptics, tonics and stimulants. A mixture that has served well here is the following:

℞.
  Fowler's Solution .... ℥ i
  Syrup of Lacto-Phosphate of Lime ....fl. ℥ vi
M. Sig.—A teaspoonful in water one hour after meals.

On alternate weeks take:

℞.
   Tr. of Iron .... ℥ i
   Phosphoric Acid (dil.) .... ℥ ss
   Syrup Simplex, q. s. ....fl. ℥ iv
M.   Sig.—A teaspoonful before or after meals, in a half wine
   glassful of water.

Chronically inflamed joints, and other portions of the limbs, attended with infiltration of tissue, frequently demand the external application of iodine, turpentine, or some one of their combinations, and the part snugly bandaged; the compression aids the circulation of the blood and adds comfort to the part.

Much care should be exercised in selecting a diet suitable for a case of inflammatory fever, especially if it originates from a septic infection. The stomach sympathizes keenly with the systemic taint, which is frequently manifested by nausea and vomiting; especially is this the case where the morbid condition has gone on to suppuration. As a rule, food should be given hot, and drink cold, and then only in moderation.

Broths, gruel, and milk, are usually well borne, as are the several extracts of meat. Buttermilk is taken with a keen relish by some, and the juices of fruit are not despised. In hectic states ice cream is craved and the several ices find a place. The diet list should not be too limited, as a capricious appetite demands a frequent change of food. Food to be relished should be prepared and served by one versed in culinary art, and alert to the many little whims of the indisposed.

SEPTIC INFECTION

In surgical work much is said of sepsis, and antisepsis, and to a great extent the success of the operating surgeon or gynecologist depends upon his thorough realization of the significance of these terms. It is understood by the term sepsis that there exists a condition of infection; in other words, there is present one or more of the specific organisms. However important each class of germs may be in relation to diseased conditions, only two will receive attention here, viz.: The staphylococcus pyogenes aureus, and the streptococcus pyogenes. The

former is perhaps the most frequently met with in surgical experiences, and is responsible for such conditions as stitch-hole, and other acute abscess formations, while the second class is met with in septic inflammatory conditions; for example, suppuration resulting from erysipelas, and septic peritonitis following abortions and abdominal operations.

When there is present a general blood infection caused by extensive bacterial invasion, we have a condition of acute septicæmia, while pyæmia is the result of a localized invasion of pyogenic bacteria, frequently giving rise to multiple abscess formations.

Asepsis has reference to that condition of the system known to be safely free from septic, or uncleanly matter; such is the object sought for when resort is had to such remedial agents or germicides known to be antiseptics, for the cleansing of the operator's hands, and the site of an operation previous to a surgical interference.

Antiseptics are agents that destroy bacterial organisms, or at least render them non-virulent and incapable of giving rise to infection. This may be accomplished mechanically by thoroughly washing and scrubbing, or in a chemical way by the use of the mercurial or formalin solutions, and by the application of boiling water and steam.

In the following list the chief antiseptics are named, and the strength of each in solution used in operative work:

Corrosive sublimate (1 to 1000 and 1 to 5000), used with caution.

Formalin, a two per cent solution used to cleanse wounds and ulcers, abscess cavities and sinuses. This agent is also used to sterilize catgut and instruments.

Permanganate of potassium, a saturated solution, in which the hands are immersed previous to operative procedures; also used in one or two per cent solution for the cleansing of wounds, ulcers and abscesses, and washing out the bladder in chronic cystitis.

Alkaline solution, composed of biborate of soda, three drachms; salicylic acid, one drachm; glycerine, two drachms; boiling water, one quart. This mixture will find a greater field of usefulness in general emergency work than any at our com-

mand. It will prove efficient as a wash and dressing in all septic inflammatory conditions, especially should the parts be threatened with gangrene. It can be made in various strengths, to meet the demands of any wound infection. The cheapness of the ingredients will commend it, especially in extensive affections.

A further consideration of septic germs, and their relation to diseased conditions, will be found under the head of Bacteria, found in another part of this work, to which the reader is referred.

TEMPERATURE IN DISEASE

Taking frequent observations of the temperature of the body during systemic disturbance caused by disease or surgical operations is essential for diagnostic purposes. The onset of disease can be detected with the thermometer in the mouth long before physical signs will give evidence of the oncoming change. Thus a rise of temperature every afternoon is likely to be the forerunner of tubercular infection, and a developing abscess, however small, will provoke a nervous disturbance that will give rise to a degree or more of temperature above normal.

Temperature is calculated by the Centigrade and Fahrenheit scale, the latter being in most common use. One degree Centigrade equals 1.8 degrees Fahrenheit, and to convert the former into the latter, we multiply the degrees Centigrade by 1.8 and add 32. For example: Forty degrees Centigrade multiplied by 1.8 equal 72, add 32, equal 104 degrees Fahrenheit.

Fahrenheit is changed into Centigrade scale by deducting 32 from the former register and dividing the result by 1.8. Example: 104 degrees Fahrenheit minus 32, divided by 1.8, equal 40 degrees Centigrade.

In general acute diseases, for every degree of temperature above 98 degrees, there will be an increase in the pulse rate of ten beats per minute. There are exceptions to this rule in grave cases of collapse in certain stages of cholera, and following severe surgical operations; here the temperature is likely to be subnormal and the pulse is markedly increased.

Morbid conditions of the system giving a sub-normal temperature of two or three degrees, or a rise of temperature above 108 degrees, and remaining for any length of time, generally indicate a fatal termination.

The average normal temperature is 98.6 degrees F., taken in the mouth; 99.3 degrees taken in the vagina or rectum, and about 97.4 degrees in the axilla. These ranges of temperature are modified by age and the influence of atmospheric pressure; other than these the change is wrought by disease.

The taking of the temperature should not follow immediately after drinking cold water. The bulb of the thermometer should be placed well under the tongue, and allowed to remain at least two or three minutes to allow the mercury in the tube to be evenly influenced by the temperature.

Elevation of temperature two or three degrees soon following operative procedures, preceded or not by rigors, indicates infection, and will require a close inspection of the wound, dressings, and the patient's immediate surroundings.

A rise of temperature to 122 degrees F. has been recorded following an injury to the cervical spine, the patient ultimately recovering. The ravages of tetanus are often attended by a temperature ranging from 108 degrees to 112 degrees. Dr. Jacobi, of New York, reports a case of injury where the temperature registered 148 degrees F., taken in the mouth, rectum and axilla, yet the patient lived. Dr. Welch, of Omaha, mentions a case of extensive injury to the spine where the temperature registered 171 degrees F. for several hours. He failed to state whether or not the patient survived.

ASEPSIS

The chief aim in practicing asepsis is to free a portion or the whole of the system from infectious and putrefying material as far as possible, preparatory for operative work, and keeping the wound germ free during the healing process. It must be understood that it is not always possible to keep a wound technically sterile, even after adopting any and all measures usually put in practice by modern surgery; but keeping the opera-

tive field "clean," infective organisms are reduced in numbers and are rendered so non-virulent that they do not give rise to pronounced conditions of sepsis.

One often hears surgeons remark that they do their operations under strict antiseptic precautions, yet to observe them in their work, comparatively few are consistent in the technique to which they lay claim.

On one occasion the author witnessed a surgeon of considerable note do a laparotomy without removing his ring, and another wiping away drops of perspiration from his nose with the back of his hand while he was at work. It is not an uncommon thing to see operators pick up an unsterilized instrument, needed in an emergency, the use of which would put to naught all other aseptic precautions. To become familiar with aseptic and antiseptic technique the surgeon, to appreciate its possibilities, should take at least an elementary course in bacteriology.

The brilliant results obtained in modern surgical operations are largely due to the scientific application of aseptic and antiseptic technique, both in the preparation of the patient and in all the successive steps connected with the operative procedures. It is claimed by bacteriologists that every wound that is made by the surgeon is soon infected by micro-organisms that are capable of setting up inflammation, that often results in suppuration, if the aseptic preparation is faulty in any of its details. On the other hand, some surgeons argue that they have been successful in their operative work and have paid but little attention to detail technique so urgently advised by those who believe in thorough antiseptic procedures. In some instances their cases do well owing to the fact that the resisting power of the patient is so vigorous as to prevent germ infection. The author was once called upon to dress a stab wound of the abdominal walls, in a drunken man, the outcome of which well illustrates the systemic resistance against wound infection. After receiving the wound he fell into a ditch of muddy water; a large portion of the intestines escaped through the rent in the abdominal walls, and became badly soiled with the debris of the pool while he was trying to extricate himself. Being in a section of the country remote from a hospital, or even a drug store, and

limited to the instruments in my pocket case with which to operate, and no "technically" sterile dishes, solutions and dressings with which to dress the wound, except a milk crock, warm saline water and table napkins for compresses, I flushed the exposed intestines thoroughly with the saline solution and returned them within the abdominal cavity, after enlarging the rent in the abdominal walls. I then closed the wound with catgut, adjusted the napkin compresses and applied a bandage. The wound healed without suppuration and the temperature never rose above 100, and he was up and about the sixteenth day. Could a better showing have been made under careful antiseptic precautions? Would a similar result likely follow other cases of like nature? We have not yet arrived at that stage of aseptic perfection in our surgical work that insures an absolute freedom from germ life, considered from a bacteriological standpoint, but the surgeon who strives for such an ideal will undoubtedly have better results than those that have no such standard to work from.

ANTISEPTICS, DISINFECTANTS AND DEODORANTS

Substances, fluid or powder, which possess power to destroy germ life, are called antiseptics. In their use it must be borne in mind that while they destroy germ life they are also potent enough, in certain strengths, to seriously affect the tissue cells exposed in the wound. The action of these chemical agents upon the leucocytes has a tendency to destroy their phagocytic function, and for this reason if for no other, it is in the main, bad practice to make use of the strong chemic solutions during an operation, and for extended use in post-operative dressings. The ideal antiseptic for dressing traumatic surfaces is sterile water or sterile saline solution.

The frequent sterilizing of the hands with the usual antiseptic solutions leaves them hard and rough, and hardly fit to handle the delicate structures of the abdominal cavity. A liberal scrubbing with green soap and water, followed with hot sterile normal saline solution (℈ iss chloride of sodium to ℥ 33½

of sterile water), will, if properly done, give equally as good results, and is much safer.

In some phases of wound infection the most potent antiseptic solutions are required, especially in septicæmia and pyæmic states. Here bichloride, in 1-3000 to 1000, and permanganate of potash in from 1 to 2 per cent, will, when locally applied, retard germ growth. They should be used for a limited time, and then give way to the alkaline solution referred to in another part of this work, or to the saline solution.

A 1-1000 bichloride solution is prepared by adding 7½ grains of the corrosive sublimate to one pint of sterile water; a weaker or stronger solution may be prepared by increasing or diminishing the amount of water. Some surgeons prefer equal parts of bichloride and sodium chloride to the amount of 7½ grains to the pint of sterile water, claiming less toxic effect upon the tissues. While using the drug its poisonous character should be kept in mind and the symptoms of its toxic effect watched for; salivation, with a metallic taste in the mouth and a blue line at the margins of the gums together with a spongy state of the tissues of the mouth, are some of the early symptoms manifested. Later diarrhœa and vomiting may supervene. The treatment consists in withholding the use of the lethal agent and the administration of liberal quantities of milk, albumen, lime water, and magnesia to control looseness of the bowels.

Permanganate of potassium solution is prepared by adding 15 to 20 grains of the salt to the pint of hot sterile water. It is considered a safe antiseptic agent on account of its being non-toxic; it is of special benefit in cleansing abscesses and other suppurative surfaces of pus and necrotic tissue. An objectionable feature of the drug is its tendency to stain the skin a brown color; this can be removed from the hands and other exposed portions of the body with a saturated wash of oxalic acid in water ($\mathfrak{Z}$ ij) water (qt. j). In connection with its availability as a suitable antiseptic agent for the dressing of suppurating wounds, it possesses marked disinfectant and deodorant properties. It is often made use of to dress foul smelling ulcers and wounds and to deodorize slop-jars and chambers after bowel movements in typhoid and other septic fevers. When permanganate is used to disinfect the hands previous to doing operative work, oxalic acid,

in a saturated solution, is used in connection with it; after washing the hands in the acid solution, they should be rinsed in sterile water or normal saline mixture.

Creolin is one of the most active of the coal tar products. On account of its non-toxic and non-irritant properties it has been generally adopted by the war department of the United States for use in the army. In action it is both antiseptic and deodorant. One objection to its use, especially to disinfect surgical instruments, is the opaque mixture it forms when added to water.

For cleansing purposes and dressing wounds the agent is used in a two per cent solution. For disinfecting the hands a 5 per cent mixture will be required (6 teaspoonfuls to a pint of water). Lysol, also a tar product, is a non-irritant antiseptic, and possesses deodorant properties; it is not as favorably received by the surgical profession as creolin, largely on account of its saponaceous character when added to water, except the water be distilled, or glycerine be added to it. It is usually recommended in from 1 to 5 per cent solutions; 3 ii to the quart of distilled water makes a 1 per cent solution.

Carbolic acid is in common use as an antiseptic dressing for about every variety of wounds, especially among the laity. The drug is also a coal tar derivative, being obtained from that substance through the process of distillation. It is obtained in commerce in pinkish white crystals which are readily soluble in hot or cold water or the admixture of glycerine and water. By the aid of heat, water will dissolve and hold in solution about twenty-five grains of the crystals to the ounce; a few drops of glycerine adds to the stability of the solution. Besides being an active antiseptic it possesses the properties of a disinfectant and deodorizer in a marked degree and to a limited extent that of a local anæsthetic. A five per cent solution of the lethal agent will irritate the skin and benumb the fingers; clothing and instruments can be subjected to its caustic action for an indefinite time without discoloring them. It is the only antiseptic in which an instrument, needed in an emergency, may be immersed for a minute or two and then rinsed in sterile water that will render it safely free from micro-organisms.

It is claimed that the temper and edge of keen cutting in-

struments are in a measure destroyed by allowing them to remain for any length of time in pure carbolic acid.

The acid that is usually purchased in the market in liquid form is or should be ninety-five per cent pure, five per cent glycerine being added to the pure crystals to liquefy them.

Systemic poisoning has been produced from a prolonged use of phenic acid solutions in the dressing of wounds and other morbid states; evidence of its toxic effect will be noted by a cloudy vision, ringing in the ears, dizziness, a perverted taste and dark coffee colored urine.

Phenic acid is used in various strengths for the treatment of skin diseases and traumatic injuries, a two per cent solution is considered safe and is usually kept in stock by surgeons for clinical work. This solution may be prepared by adding one hundred and twenty grains to the pint of distilled water; a few drops of glycerine added insures its stability.

The most reliable antidote for poisoning from swallowing carbolic acid is liberal doses of magnesia sulphate, if taken immediately following the taking of the lethal agent. Alcohol in graduated doses slightly diluted with water is also a safe antidote. These agents are to be followed by milk, lime water or a thin solution of flour in water.

Formalin is an active germicide; it is a forty per cent solution of Formaldehyde gas in water. The solution thus prepared is also known as formol, and formal. It has a pungent odor, is colorless and non-poisonous; on account of these properties it is available as a potent antiseptic. By some surgeons the agent is considered as active an antiseptic as is a 1-1000 bichloride of mercury. It also contains potent deodorant properties; as a dressing to fresh wounds it often proves too irritating in any strength over 10 per cent.

The vapor is utilized to fumigate contaminated clothing, wards and sick rooms, also surgical dressings and instruments. For purifying hospitals and sick rooms the full strength solution is sprinkled on sheets or other articles of clothing and hung up in the room after all openings have been stopped with bits of paper or rags. Twenty-four to forty-eight hours is usually the time allowed to free the sick room of contaminating germ-life.

For the sterilization of instruments a 1-2000 or 1-1000 so-

lution is utilized. As a disinfectant and deodorant the potent agent may be used as a spray in a two to five per cent solution.

Peroxide of hydrogen possesses marked antiseptic properties and is in common use in the treatment of the sore throats of diphtheria, and in wound infection. It is considered a safe agent in the hands of the patient and friends, being non-irritating and non-poisonous. On being added to fresh wounds or purulent surfaces active effervescence takes place at once; by this action of the drug deep wounds and abscess cavities may be freed from purulency where other means may fail. As purchased in commerce it is a colorless liquid, having a somewhat pungent bitter taste, contains about three per cent pure dioxide and is to considerable extent volatile. The solution should be kept tightly corked and in a cool place.

There are several other chemical agents having feeble antiseptic and disinfectant powers that are in quite common use with the laity in dressing ulcers, wounds, scalds, burns etc. Chief among these may be mentioned biborate of soda, boric acid, salicylic acid, alcohol, boroglycerid, naphthol, phenol sodique, ichthyol, orthoform, protargol and Thiersch's solution. The latter is composed of salicylic acid two parts, boric acid twelve parts to water 1000 parts. This solution is alkaline in character, unirritating and non-poisonous. It is especially beneficial in the treatment of ulcerative skin diseases.

Besides chemical antiseptics and disinfectants, heat, both moist and dry, holds first place. In utilizing this potent agent it will be in the nature of sterilization; moist heat may be applied in the form of steam and boiling water. Dry heat in the form of hot air produced in an oven while it remains over a flame.

It is claimed that boiling water will kill all germs other than anthrax within five minutes. Steam heat is slower in its action on germ life than boiling water but more powerful than hot air. Live steam produced under pressure will destroy all micro-organisms in' from five to fifteen minutes, according to the nature of the germ and their power of resistance.

As stated elsewhere, hot air is less powerful than either steam or hot water, it requiring from one to two hours to de-

stroy all forms of micro-organisms, even to anthrax spores, when subjected to a heat in a hot air sterilizer of 302 degrees F.

AGGLUTININS—(See Immunity)

ANÆSTHETICS

Anæsthetics in general use are chloroform, ether and nitrous oxide; the relative importance of each is in the order named. Nitrous oxide has the preference in brief operations requiring one or two minutes; ether in work requiring the limit of time, while chloroform is much more agreeable to the patient than ether, and is more frequently administered in emergency cases.

Anæsthesia is frequently commenced with chloroform and later displaced by ether in prolonged operative work. Ether is preferable to chloroform administered by gas light; the gas flame should be above and a safe distance away.

The agent being a vaso-motor stimulant, it is given in endocarditis, syncope, fatty heart, and in operative work where shock is to be reckoned with as a factor.

Chloroform is given in nephritis and in acute pulmonary affections, wherein ether would be contraindicated. Its administration being very pleasant commends its use in children, nervous and hysterical females. The fumes of chloroform coming in contact with a lighted flame for any length of time, generate a caustic gas that is very offensive to inhale.

The respiration and heart's action must be observed during the period of pronounced anæsthesia; should either show a slow and labored action, withhold the lethal agent and give fresh air, lower the head and slap the chest walls vigorously with the open hand, during which time the tongue must be grasped and pulled forward allowing free passage of air.

The inhalation of the vapor of strong vinegar immediately following the administration of chloroform will prevent retching and vomiting. It is well in some anæmic and nervous patients to advise a full dose of whiskey or one-eighth grain of

heroin given hypodermically one hour before giving the anæsthetic. In cases of extreme weakness or collapse one-thirtieth grain of nitrate of strychnia is commended instead of the heroin.

Surgical operations of a minor character can be done under local anæsthesia. Such work will comprise lancing abscesses, carbuncles, removing foreign bodies from the flesh, such as slivers, pieces of steel, emery, and other like matter. Amputation of the toes and fingers, and even operative measures for the cure of hernia, have been successfully done under the insensibility produced by cocaine, eucain, or some one of their combinations, hypodermically administered.

A four per cent solution of cocaine is a sufficiently potent mixture for all operative purposes, applied to mucous surfaces or hypodermically administered; ten to twenty minims being a dose which can be repeated should the operation be prolonged. The operative work should be commenced within five minutes after the instillation of the drug, thus avoiding, if possible, any constitutional symptoms.

Ether spray directed on an exposed part for three to five minutes makes an efficient local anæsthetic, as does two parts of crushed ice to one part of salt, applied in a gauze bag. Cataract operations on the eye can be executed after the instillation of a four per cent solution of cocaine twice repeated at an interval of five minutes.

Local anæsthetic methods, as a rule, are not popular with children and nervous individuals. They become dismayed at the first sight of flowing blood whether they experience any pain or not.

The subject of anæsthesia would be incomplete without reference to the intraspinal injection of a solution of cocaine and eucain. This method of anæsthesia is resorted to for painless operations on parts below the seat of injection, and in obstetrics. Fifteen drops of a two per cent solution is an ordinary adult dose in prolonged operative work; ten drops for brief operations. Extreme care must be exercised in preparing the solution, and the drugs should be from the laboratory of a reliable chemist, bearing in mind that the danger in this method of anæsthesia is largely due to a faulty technique in preparing the solution.

A perfect hypodermic syringe with a specially made needle

about three inches in length, sharp at the point, the bevel being short, and thoroughly sterilized, is the one instrument needed for the delicate work.

To execute this operation, the patient is seated on a table or chair, the body inclining slightly forward; draw a line transversely across the back on a level with the extreme points of the crests of the ilii; barring deformity, the line will cross the tip of the spine of the fourth lumbar vertebra, just beneath which, and about one-half inch to the right of the median line, the needle is introduced, pressing it carefully forward and a little to the left till the point enters the spinal canal. A few drops of cerebrospinal fluid escaping from the needle will be evidence sufficient that the meninges of the cord have been punctured. Now that proof of entrance into the canal is established, attach the syringe charged with ten or fifteen drops of the cocaine solution and slowly force the fluid within the spinal canal. The anæsthetic effect is pronounced, usually in ten to fifteen minutes, and continues from one to two hours, and in some cases the effect extends over a longer period of time.

Headache, nausea and vomiting, rigors and general weakness sometimes follow intra-spinal anæsthesia, but with nervous individuals these effects are likely to result from shock produced by being conscious of the operation as it proceeds. With proper antiseptic precautions and in the hands of a careful operator, this method of anæsthesia is legitimate and safe, and is preferable in many cases where general anæsthesia would be contraindicated.

Novocain, a new anæsthetic agent, has, in a great measure, displaced cocaine principally from the fact that it is nonirritant and is not poisonous when introduced into the tissues with a hypodermic needle in reasonable quantities. This potent agent should be combined with adrenalin chloride solution 1-1000 when used for its anæsthetic effect, the strength of the mixture varying to meet the requirements in any given case. A solution of the drug may be sterilized by boiling, a decided feature in its favor. It is much cheaper than cocaine, another advantage to the user of the agent.

A four per cent solution of the drug is strong enough for the severest tests to which the agent may be put. By local

anæsthesia produced by deep and superficial injections, the author has amputated feet and hands, legs and arms, executed herniotomies, and several laparotomies, without pain or distress, and with no evidence of toxic effect of the drug following the work.

The syringe before using should be sterilized only in boiling water as some of the antiseptic agents in common use when made in solution precipitate novocain.

LOCAL ANÆSTHESIA IN THE EXECUTION OF SURGICAL WORK

Thirty odd years ago when the author was a student of medicine, A. Jackson Howe, then professor of surgery in the Eclectic Medical Institute, now the Eclectic Medical College, stated to a class in surgery, when lecturing on anæsthetics, that "the ideal anæsthetic would be the one that would produce insensibility without danger to life, and he believed the day was near at hand when the chemist would place before the medical profession an agent or combination of agents that would be potent and safe enough to fulfill these expectations." At about the time this statement was made it was estimated that one death occurred to every five thousand administrations of chloroform, and one to every six thousand of ether, the then popular anæsthetics. It is now estimated that on an average there is one death to every fifteen thousand administrations of ether. The latter, then as now, being considered the safest of the two drugs for long periods of narcosis, yet it is less potent than chloroform and much more disagreeable to inhale. Instances are numerous where complete narcosis cannot be secured through the administration of ether alone in muscular individuals of great resisting power; in such cases the lethal agent is generally exchanged for chloroform until the stage of insensibility is produced, when this state can be maintained by reverting back to ether. It is in such cases as these where excessive amounts of the benumbing agents are made use of that great danger arises from the cessation of respiration and the heart's action. That there is danger from the toxic effect of the above mentioned general

anæsthetics no one will dispute, hence a safer agent is sought for general anæsthesia. Up to the present time none has been found, but strenuous efforts are being made in that direction and success will yet repay those who are experimenting along this line.

It is to avoid the too frequent use of chloroform and ether in general surgery that so much attention has been given to the production of local anæsthesia for minor and some major surgical operations.

In a somewhat extended experience in operative work by the aid of local anæsthesia, the writer can not help but note the freedom from unpleasant after-effects that are experienced after the use of chloroform and ether, or their compound, the A. C. E. mixture. In no particular is the result so much in evidence as is shown in operative work done on individuals who are physically reduced by a long period of suffering from disease and who have little resisting power to withstand the depressing effect of an extended narcosis.

Before proceeding to recount the many applications to which the local anæsthetic may be utilized with perfect satisfaction, a brief consideration of the potent agents used to benumb the tissues and the method of their preparation for the special work will not be out of place in this connection:

Cocaine by rights should be mentioned first as it was the pioneer alkaloid and one which affords a great range of usefulness in its application. It is used in various strengths and in combination with other stupefying and antiseptic agents that intensify and render its use safe.

Its use should be limited to operations superficial in character and where the incision will soon follow its infiltration. Chief among such may be mentioned the opening of boils, abscesses and felons; the extraction of teeth and of foreign bodies from the eye or skin surface. Applied locally to the external auditory canal and the urethra, examination of these channels, instrumentally, may be conducted without inflicting pain. Under its benumbing influence an external urethrotomy may be executed and a circumcision done with no distress to the patient other than the needle puncture when introducing the anæsthetic beneath the integument. When applied to the irritable surface

of a fissure, fistula, or ulcer of the anus or rectum, incision, curettement, or the application of caustics may be accomplished without giving pain to the patient. Under the influence of a two per cent solution of the alkaloid with adrenalin solution added, injected beneath the skin, ligation of superficial bloodvessels is accomplished and tenotomy executed with comparatively little distress. Formerly it was used in connection with adrenalin chloride solution to produce spinal anæsthesia, but of late a five per cent solution of novocain in normal saline solution has been substituted with less disturbance to the nervous system. In operations on the nose such as the removal of polypi, enlarged turbinated bones, and foreign bodies, the procedure is generally rendered painless by previously painting the mucous surface surrounding the morbid growth with a four per cent cocaine solution with a few drops of adrenalin chloride solution added.

The alkaloid is used in from one to four per cent solution with adrenalin chloride, the weaker mixture for hypodermic injection, and the stronger for external application.

Schleich prepares a solution of the drug in three different strengths as follows:

No. 1.

℞.

Cocain Muriate	gr. iij
Morphine Muriate	gr. ⅜
Sodium Chloride	gr. iij
Phenol	gr. ij
Distilled Water	℥ iijss

M.

Used in case strong injections are required.

No. 2.

℞.

Cocain Muriate	gr. iss
Morphine Muriate	gr. ⅜
Sodium Chloride	gr. iij
Phenol	gtt. ij
Aqua Dest.	fl. ℥ iijss

M.

For general use, but a weaker solution.

No. 3.

℞.

Cocain Muriate ....gr. ⅙
Morphine Muriate .... gr. ⅜
Sodium Chloride .... gr. iij
Phenol .... gtt. ij
Aqua Dest. ....fl. ℥ iijss

M.

Used when large areas are to be infiltrated.

In the preparation of the above solutions the water should be carefully sterilized and the other ingredients should be fresh and free from dirt. The amount of morphine added to the solutions increases and prolongs its action, and the phenol renders it antiseptic.

Eucain should perhaps be mentioned next as of some importance in the production of local anæsthesia. It is slower in its effect upon the tissues than cocaine but is a safer agent to use in operations requiring a considerable length of time in their execution. It is used in strength of from two to ten per cent solutions made with normal salt water which may be sterilized by boiling. Like the cocaine solution it can be used hypodermically or applied locally to mucous membranes. Its range of application is about the same as is that of cocaine.

Novocain has by far the widest range of application of any of the local anæsthetics in general use, because of its potency, its absence of irritation to the nervous system, and its freedom from noxious effects upon the body. It is used in various forms to meet existing conditions; thus in powder form or in a ten per cent solution in sterile salt water the drug will completely narcotize the surface of an ulcer, the cornea, and a limited area of mucous membrane. The addition of adrenalin chloride to a solution of the drug will greatly increase its potency and besides it greatly lessens hemorrhage from the tissues involved in the field of operative procedure.

Many minor and several major operations can be painlessly executed under the local stupefying effect of this agent. The variety of minor work that can be done will correspond with that mentioned in connection with cocaine anæsthesia. The technique of its application is the same as was advised in the use of

that alkaloid. It is in the execution of the severer class of operations that the use of novocain takes precedence over other agents of like character, as it can be used endermically up to 3 drachms of a five per cent solution, with adrenalin chloride added, before and during the progress of the operation with no symptoms of irritation whatever, a matter of great consideration to individuals whose physical condition is such that a general anæsthetic would be contraindicated. Its use can be particularly emphasized in executing herniotomies, varicocele, abdominal incision, the removal of benign tumors, and the amputation of the upper extremities, and the lower extremities to the knees.

Before the surgical class of the California Medical College during the winter of 1910 the writer did an abdominal section in an elderly man who was suffering from ascites by the use of a four per cent solution of novocain injected superficially and deep into the tissues along the line of the intended incision with a hypodermic needle. The patient said that he experienced no pain while he rested upon the operating table watching the progress of the operation.

To illustrate further the possibility of doing major work safely and painlessly under the benumbing influence of this anæsthetic agent I will mention that on August 3rd of last year I amputated the leg midway between the knee and the ankle of an elderly gentleman suffering from gangrene of the toes. The technique in the production of anæsthesia of the part involved in the operative work commenced by injecting a half ^drachm of a four per cent solution of novocain deep in the popliteal space near the bifurcation of the sciatic nerve into the external and internal popliteal branches after the leg had been prepared for the operation and the tissues rendered, in a measure, bloodless by the application of an Esmarch's bandage and cord. Immediately following the infiltration of the tissues surrounding the nerves in the popliteal space superficial and deep injections of the anæsthetic fluid were placed in the tissues at the point selected for the amputation. After the lapse of ten minutes anæsthesia of the tissues was complete, when the limb was removed quickly without pain or shock; the old gentleman looking on the while to avail himself of the opportunity to "holler" as he said when he felt the first twinge of pain, but no outcry

was heard and at the conclusion of the operation he turned to the physicians and nurses that were present watching the procedures under this form of anæsthesia, and said, "That never hurt me a bit." Narcotizing the external and internal popliteal nerves made it possible to sever the bones of the leg with no evident distress whatever. Outside of a little nervous agitation the patient was not visibly affected. The respiration and circulation during the period of anæsthesia were not notably changed, and no unpleasant after-effects were experienced, such as probably would have been observed had chloroform or ether been administered.

Other cases operated on under the local anæsthetic effect of this alkaloid might be mentioned in this connection but the two cited above very well illustrate the kind of major operations that may be attempted under its use.

In operations of some magnitude the patient will be placed in a better condition both mentally and physically to withstand the work, if the local anæsthesia is preceded by a hypodermic dose of Abbott's H. M. and C. tablet, either half or full strength, as may be best suited to the age and condition of the patient who is to undergo the operation.

For spinal anæsthesia novocain should be used in preference to cocaine on acconut of the slight toxicity of the former. It is estimated after careful experiments upon reptiles and animals, to be six times less toxic than cocaine, and besides, it is one half cheaper, two valid considerations in its favor. It should always be used with adrenalin added, which will markedly increase its potency. A solution of the drug should not be boiled to sterilize it after adrenalin chloride solution is added, as such a procedure causes a loss of the active principle of the latter.

Other alkaloids having narcotic effect in certain strengths when applied in solution to the mucous membranes, or introduced into the tissues with a hypodermic needle have from time to time been brought forward by the medical profession to take the place of cocaine, chief among these may be mentioned **tropococain** used in five to ten per cent solutions; **beta-eucain** used in various strength solutions with adrenalin up to fifteen per cent, for topical applications to mucous membranes; **stovain** has been in common use in the past for its narcotic effect on the terminal nerves but it has been succeeded by agents more potent in char-

acter. Of late a new anæsthetic compound, composed of quinine and hydrochloride of urea, has come into marked favor in producing local anæsthesia for the execution of operations that are of necessity prolonged. The anæsthetic effect of the compound is lasting, which makes it the agent of choice in operations where efficiency is required and post-operative pain would be a feature without it being subdued by some deadening remedy. Its range of application will compare favorably with that of novocain, but owing to the fibrous character of the quinine it may, in a measure, prevent as rapid healing of tissues as takes place after the work done with cocaine and novocain narcosis. This agent should not 'be used in operations that can be quickly executed; cocaine solutions should be used instead. It is not as efficient as cocaine or novocain for mucous membrane absorption, and by operators who make much use of the mixture it is not favorably thought of in this connection. Adrenalin chloride is seldom added to a solution of the combined alkaloids as it adds to the bulk of the mixture without increasing its efficiency. The combined alkaloids are inexpensive, efficient, and absolutely safe, all desirable features in its favor. It is used in from one to three per cent solution which is made in hot sterile water when needed for immediate use. Especially is its use commended in operations on the anus and rectum, varicocele, hydrocele, the removal of superficial tumors and abdominal section. In operations in the nose and mouth a cocaine solution should be substituted. Herniotomies can be painlessly executed under its influence and minor amputations done.

Its principle method of use is by infiltration throughout the area to be operated on. A brief statement of the course usually followed in doing an inguinal herniotomy may, I hope, be of interest and not out of place here. First see to it that the anæsthetic solution is carefully made, and after the inguinal region and the genitalia have been properly prepared a one per cent solution of quinine or quinine and urea hydrochloride is injected superficially and deep in the tissues along the course of the inguinal canal; after a wait of eight to ten minutes the tissues overlying the canal may be incised and usually without pain unless the technic of the infiltration has been faulty. Divided blood vessels should be picked up and ligated as soon as severed, but by

exercising a little care they, as well as some of the important nerves that traverse this region, may be exposed and drawn to one side with a small blunt retractor, thus preventing injury being done them. The dissection down to the hernial canal should be executed as rapidly as possible when the sac should be dissected free from the cord with the fingers; if adhesions are found to exist, open in its median aspect to ascertain whether or not the protruding knuckle of intestine may not be adhered to some portion of its inner surface, which is not infrequently the case; if such a condition is found the delicate adhesions should be freed with the finger or handle of the scalpel and forced above the point where the sac is to be tied off, with an encircling silk ligature; the sac should then be cut away, the line of severance being far enough from the constricting medium to insure its not slipping off the end of the stump. Following this step the conjoined tendon of the external and internal oblique muscles are joined to Poupart's ligament with fifteen-day cat-gut, when after clearing the wound of excess fluids the margins of the fascia of the external oblique and skin are closed with catgut in the usual way and dressed with sterile gauze pads which are held in place with several turns of a spiral bandage.

The frequency of the subsequent dressings will depend upon the healing progress of the wound and whether or not suppuration follows the operative procedure.

Nearly every variety of hernia can be operated on under the use of local anæsthesia by studying the anatomy of the parts involved to ascertain the location of nerve trunks and their intervening branches, to know where to inject the anæsthetic fluid that the best possible results may follow its filtration.

Owing to the special care necessary in every step of the operative work under local anæsthesia a little more time is generally required to complete the operation, but once it is finished the patient is thankful that he does not have to suffer the after effects often experienced from the administration of chloroform and ether.

The technique of many operations that can be executed under local anæsthesia might be recited here, but the principles involved in any and all work of this nature have been heretofore recounted in this article, hence we will pass to the various meth-

ods by which the best possible results may be obtained. The most common method practiced by operators is by infiltration, a process of diffusion of the anæsthetic fluid throughout the tissues that will later be involved in the operative work. This is accomplished by injecting the deadening fluid superficially and deep in the tissues, thus benumbing the terminal nerves.

Cocaine is used in one half to one per cent for this work and novocain in double to four times the strength of cocaine. If it is possible to approach the main trunk of a nerve that lies superficial through an incision in the skin and superficial fascia, large areas may be rendered insensible to operative pain by injecting into the sheath surrounding the nerve a few drops of the selected anæsthetic agent. By this method amputations and other operations of some magnitude may be done without pain or distress. The writer not infrequently deadens the skin surface with cocaine and the deeper structures with novocain giving the latter ten minutes and the former five minutes of time to expend its force on the nervous structures.

Schleich's method of edematization with weak solutions of the benumbing agents proves satisfactory in opening deep abscesses, removing foreign bodies from the flesh, opening up sinuses, doing the operative work for the cure of hydrocele, varicocele, and many other similar operations. Several drachms of the deadening fluid may be used for the purpose with absolutely no danger to the patient whatever; ounces are used in some cases. A small needle should be used to introduce the fluid which, with the syringe, should be thoroughly sterilized before using.

Applied locally to mucous membranes the several anæsthetic agents are used to the full recognized strength of the drug, care always being taken to not use an excess of fluid that it may run over a considerable surface, increasing the liability of extensive absorption even to the point of danger. When possible the solution should be applied on a pledget of cotton and held in contact with the part to be anæsthetized for about ten minutes, a four per cent solution of cocaine being considered of sufficient strength for the purpose. Novocain in a ten per cent solution, and the soluble mixture of the hydrochloride of urea and

quinine in from ten to twenty per cent solutions are equally effective.

The fact that cocaine possesses marked toxic qualities even in small doses should not be overlooked when using the potent agent promiscuously. Instances are on record where eight to twelve drops of a three per cent solution has produced convulsions and other dangerous symptoms, and ten drops of a four per cent solution has produced death.

For all ordinary work the amount of the drug used should seldom exceed one-half grain, and this had better be given in combination with morphine, as recommended by Schleich.

The toxic effect of these potent antiseptic drugs generally comes on suddenly; first the patient becomes weak and trembly, cold perspiration soon dampens the surface of the body, the features are pale and death-like in appearance, respirations are shallow and frequent and the heart's action feeble. Not infrequently the patient passes suddenly into a state of collapse from the first symptoms of the toxic effect of the drug, and from that condition into the state of unconsciousness.

To overcome the lethal effect of cocaine prompt measures must be resorted to. If at hand amyl nitrate should be inhaled to relieve cardiac depression. Camphor in the form of spirits may be inhaled with much benefit, and in the form of camphorated oil (camphor gum 1 drachm, olive oil 9 drachms), 20 drops to 1 drachm introduced beneath the skin with a hypodermic needle will greatly relieve a pending state of collapse. To relieve a convulsive condition of the body sulph. ether may be inhaled slowly, or in place of this agent chloroform may be utilized. Morphine in small doses is said to be antagonistic to the lethal effect of cocaine, but the writer has had no occasion to put the alkaloid to the test. Glonine in drop doses upon the tongue will do some good toward warding off collapse, and small doses of nitrate of strychnia hypodermically administered will whip up a lagging heart.

The deleterious effect of cocaine upon the system will depend on the amount of the drug that enters the general circulation, hence it will be a safe measure to constrict the tissues above the point of injection when the part to be operated on makes this procedure feasible. Incision of the tissues should be

made at the earliest possible moment after anæsthesia of the terminal nerves is complete, as by so doing much of the solution will escape with the blood and other tissue fluid thereby lessening the chances of systemic poisoning.

THE ANÆSTHETIZER
His Care of the Patient During and Following Operations

At the time the patient is placed in the hands of the anæsthetist he has reason to expect that the general rules for the preparation of the patient have been previously complied with, except in emergency cases: here it is often necessary that he direct the preparation for the administration of the anæsthesia personally.

To be well equipped for the giving of anæsthetics the anæsthetist should have at hand an ether inhaler, a mask for the administration of chloroform, tongue forceps to pull the tongue forward in case it droops far back into the pharynx, a hypodermic syringe and tablets of belladonna, strychnia, nitro-glycerine, brandy and adrenalin chloride; besides he should see that a sufficient amount of ether and chloroform have been supplied in advance, or he must bring it with him. Small gauze sponges and sponge holders will be needed and should be at hand as well as instruments for the performance of tracheotomy in emergency cases. The surgeon usually has these instruments with him but the anæsthetist should be forearmed with instruments to meet any accident that the giving of the anæsthetic may be responsible for.

Before the time set for the administration of the anæsthetic the patient should be carefully examined for any renal, cardiac, or respiratory ailments. The urine should be tested for albumen and sugar, the heart for any form of incompetency, and the lungs for bronchitis or tubercular infection. Then the age of the patient should be taken into consideration as well as the nature of the operation; then only can the proper anæsthetic be chosen with any degree of safety, yet it must be borne in mind during

the examination that the heart's action may be excited and irregular, and the breathing labored, if the patient's fear of the operation is not at the time, and in a great measure, calmed.

It is necessary to remove a partial plate of false teeth and even a full plate unless they fit the mouth well, before commencing the administration of the anæsthetic; a full plate fitted to the mouth prevents the lips from closing in obstructing respiration.

The nature of the operation and the wishes of the surgeon will determine the position that the patient should assume while taking the anæsthetic. If not objected to the patient should lie on the back with the head resting upon a low pillow. After the patient has become unconscious the required position may be assumed. It is considered unsafe to administer chloroform to a patient while in a sitting position; the condition of the patient may make this so, however the writer has given chloroform and seen it administered on numerous occasions with the patient sitting in a chair without a sign of impending danger. Heart complications and severe asthmatic conditions will suggest the upright position.

The chief dangers in the administration of chloroform or ether and even nitrous oxide, are their effect upon respiration and the heart's action. In the former the danger may arise from several causes, chief among which may be mentioned a too rapid administration of the lethal agent, the tongue falling back into the pharynx, ingesta obstructing the larynx after vomiting, spasm of the glottis during the inhalation of the drug, and the presence in the pharynx of large quantities of mucus; this is apt to follow a too rapid administration of ether, not chloroform. To avoid these dangers the anæsthetist should have at hand such instruments as may be required and besides be able to render such relief as each individual case may require other than surgical measures. The pharynx may be relieved from mucus with gauze sponges on sponge holders or long forceps, obstruction of the pharynx with ingesta can be relieved by bending the patient's head forward and administering sharp slaps between the shoulders, spasm of the larynx controlled by withholding the anæsthetic momentarily, or changing from ether to chloroform.

Respiratory failure due to shock, or overdose of the lethal agent will become manifest by the countenance of the patient

changing from a normal color to an ashen gray pallor, the pupils are greatly dilated and the sphincters relaxed, the respiration becomes weak and irregular and the pulse feeble. This condition demands a withholding of the anæsthetic, giving the patient plenty of fresh air or oxygen, forcing the lower jaw forward at the same time to open wide the larynx, draw the tongue forward with forceps and remove any constricting mediums about the chest and neck. If these measures fail to restore the respiratory movements resort should at once be made to artificial respiration which should be kept up, if need be, for a half hour or more.

A danger equally as great as respiratory paralysis during the administration of anæsthesia is cardiac failure. It is apt to occur at any time after commencing the administration of the drug, and is indicated by dilated pupils, a weak and fluttering pulse; the face changes to a deathly pallor, with very weak respiratory movements of the chest. It is claimed that cardiac failure occurs more frequently during the administration of chloroform than ether; such may be the record with some operators, and the reverse with others. A few bad cases may follow in close order in one operator's service while another may escape such cases altogether. In the experience of the author one serious case of cardiac failure came under his observation in thirty years, from the administration of chloroform.

When it is seen beforehand that the patient is likely to become nervous and excitable through fear, a tablet of Abbott's H. M. and C., given one hour before administering the anæsthetic hypodermically, will, in most cases, lessen the danger of any cardiac disturbance.

The treatment of respiratory failure will apply with equal force in cardiac failure. At the first indication of cardiac trouble the anæsthetic should be temporarily withheld, then if the patient's condition does not improve or grows rapidly worse artificial respiration should be resorted to till the patient's condition changes for the better; nit. of strychnia, glonoin and brandy may be given with some benefit, also the inhalation of oxygen. Besides the active stimulants given hypodermically, quite warm saline solution can be given per rectum in case of shock or great loss of blood to the immediate relief to the patient. Should the heart failure occur while doing abdominal

work the abdomen may be flushed with moderately hot saline solution and if the occasion demands it a pint or more may be left in the abdomen before closing its walls. If the legs and body of the patient are cold, hot-water bags should be placed next to them, care being taken to not burn the patient, especially while he is unconscious.

After the operative procedure is over the anæsthetist should accompany the patient to his room or ward and observe carefully the action of the pulse, respiration and color of the features and be ready to meet any emergency arising from a failure of the heart and lungs until the patient has fully returned to consciousness. He should see that the temperature of the room is suited to the condition of the patient. Quiet should be urged upon those who are required to be at the bed-side, and the patient requested to refrain from talking or unnecessarily moving about. To control nausea he can advise sips of hot water, clove tea or weak mustard tea. The author has controlled persistent nausea and vomiting with the latter agent when all other means failed after repeated trials; champagne or ginger ale on cracked ice taken in small quantities and frequently repeated will prove effectual in cases of great thirst when accompanied with pyrexia.

While the patient is recovering consciousness he may become violent and throw himself about to the extent of doing himself bodily injury. Every effort should be made to restrain his actions by reasoning with him before resorting to restraint by pinning the sheets or other articles of the bedding about him or strapping him down.

No food should be allowed for several hours following the administration of the anæsthetic, at least till the nausea has been controlled and then only sips of hot toast water, beef tea, egg albumen on cracked ice, mutton broth, or egg-nog.

BACTERIA

Bacteria infest the surface of the earth and several feet beneath it, and the atmosphere in most localities fairly teem with these vegetable micro-organisms. Even the water we drink

contains millions of these germs, yet under ordinary conditions they are harmless to both man and beast.

These micro-organisms are divided into two classes, pathogenic and nonpathogenic bacteria. Something of the history and the effect of the former in the human organism only will be considered here.

The pathogenic germs only are prone to cause morbid conditions of the body once they find lodgment therein. The most active of this class and the most important to the surgeon in his special work are **staphylococci, streptococci, the bacillus coli communis, bacillus pyocyaneus, bacillus aerogenes capsulatus, bacillus tuberculosis, bacillus tetani, micrococcus lanceolatus,** and the **diphtheria bacillus.**

Staphylococci are pus-producing germs, and are principally found on mucous membranes and the skin. They are also found in great numbers outside the body in the air, water, and in dirt.

Streptococci is one of the most virulent of the septic germs, Its presence in wounds of the body excites septic inflammation of a severe character and is the principal cause of post-operative peritonitis. Viscid watery discharges from open wounds, similar to that observed when provoked by the streptococcus of erysipelas, indicate streptococci infection. It excites acute feverish states and rapidly exhausts physical strength through its toxic effect upon the system. The germ is generally found in filth and the morbid secretions of the body.

The **bacillus coli communis** inhabits the intestinal canal and is always found in cases of suppurative peritonitis and in abscesses of the intestines and other organs of the ventral cavity.

Another important germ, the serious effects of which, in wounds. the surgeon often has to deal with, is the **bacillus of diphtheria.** Its presence soon excites a grayish white exudate upon the raw surface that greatly interferes with the healing process.

The presence of the **bacillus pyocyaneus** in a purulent wound quickly changes the character of pus from a yellow to that of a greenish hue and creates a septic irritation that markedly delays the healing process.

While the **bacillus of tetanus** is not a pus-producing germ, its presence in the fluids of the body soon generates an irritant

poison that acts principally upon the nervous system, exciting tonic spasms of certain groups of muscles. The germ enters the body through open wounds in the skin and produces an effect upon nervous tissues not unlike toxic doses of strychnia.

The **lanceolatus** germ is not only a pus-producing organism, being found in empyema and abscess formations, but its presence on serous membranes has been determined where it excites active inflammation often of a serious character.

Tubercle bacilli often find entrance into the system through the inhalation of dried sputum reduced to a fine powder, also by inhaling the breath of an individual far advanced with pulmonary tuberculosis as well as by drinking out of cups that such individuals have had access to. Wounds in a tuberculous patient often heal slowly if at all, and not frequently tuberculous matter appears upon the open surface of such injuries that will require curetting away before union will take place.

The other bacilli mentioned are not of so much importance in a surgical sense, yet their septic influence has to be reckoned with in the treatment of some traumatic cases.

Another bacterial organism not previously mentioned, but potent to create much harm, owing to its irritant and pus-producing character is the gonococcus. This micro-organism finds entrance into the system through the female pelvic organs or the lymphatic vessels of the uterus. It has been found in the purulent fluid of pelvic abscesses, pyosalpinx, ovarian abscesses and purulent peritonitis. Its presence has also been demonstrated in the joints in gonorrheal rheumatism following an acute attack of gonorrhea and in inflamed muscular structures, especially in myocarditis following attacks of the septic disease.

It will be well, when determining the cause of pelvic affections of an inflammatory character, to have in mind the important part that the presence of gonococci bears to these affections and obtain as much information as possible from the patient along this line while securing the clinical history of any given case.

The **bacillus** of **anthrax** is also a germ of considerable importance in a surgical sense, the spores of which are exceedingly tenacious of vitality, they having been known to live upwards of twenty years. Their habitat is in the blood of man and beast and is transferable by inhalation and inoculation. To infect

the system by inhalation the blood from an infected animal is dried, reduced to a fine powder and inhaled into the lungs. The inoculation is generally caused by handling meat or hides of animals infected with anthrax disease, the germ finding entrance into the system through the pores of the skin or open sores. Wounds, when attacked with anthrax infection, soon become necrotic and gangrenous. The presence of anthrax bacilli in the lungs sooner or later excite inflammatory action akin to pneumonia.

Of the pathogenic bacilli there are few whose action in the system are more spontaneous than are those of glanders. The access of the organism into the system is by inoculation through an open wound in the skin by the discharges from an infected sore coming in contact with it.

Glanders chiefly affects horses and mules and is liable to attack men who groom and otherwise care for them.

Farcy is a term that is used synonymously with glanders, but signifies the localization of the infectious disease beneath the integument, first as a granular mass that soon breaks down into pus-forming abscesses and later ulcers of considerable size unless checked in its progressive career by local and general medication.

As the germ is a pus-producer, irritation followed by pustules and ulcers on mucous membranes soon follow their lodgment there. The discharge at first is opaque, then muco-purulent, and later a greenish-yellow hue in which myriads of bacteria are found. Pronounced cases of acute glanders generally prove fatal, especially such cases as show glandular involvement about the neck and chest with pulmonary complications.

Acute farcy, when it involves the lymphatic vessels, and the serous membranes of the joints, causing swelling and acute pain, often proves rapidly fatal from septic intoxication.

Streptococci erysipelatis is a septic infective germ of great virulence. Their natural habitat is in the air, filth, and putrefying matter. In the body their presence has been determined only in the lymphatic vessels.

The presence of this specific germ in wounds excites an active inflammation, a characteristic of which is the disposition to

spread, during which time the patient has a high fever which is often accompanied with restlessness and delirium.

The micro-organism is transferred by inoculation principally by contact, hence extreme care should be taken to isolate obstetrical cases and others suffering from traumatism from a patient suffering from acute erysipelas. During the care of a case of erysipelas the surgeon should subject his hands and clothing to **thorough** disinfection, each time on leaving the patient, as the infective germ is hardy and difficult to render nontoxic.

CELLULITIS

Inflammation of cellular tissue is not uncommonly met with in a general surgical practice. It is due to various causes, the most common of which is septic infection, that often follows wounds or abrasions of the skin. The bites and stings of insects and reptiles, low grades of some constitutional diseases, and surgical operations are likewise common causes of the morbid state and are most serious in their results.

Pelvic cellulitis often follows parturition and operations upon the pelvic organs. This form of the disease generally runs an active course, giving rise to high fever, thirst, irregular and rapid pulse, pelvic tenderness and pain with functional derangements of the bladder and bowels.

In character, cellulitis is either diffuse or circumscribed; the former is noted in pelvic inflammation and large inflamed areas similar in appearance to phlegmonous erysipelas, while the latter becomes manifest in felons, boils, abscesses and the inflammation of tendons and their sheathes. There is present more or less swelling and redness of the skin surface over the affected area, with tenderness on pressure, accompanied with pain, often of a throbbing nature.

Infected wounds of the fingers, however small, are generally followed by local redness which extends up the limb over the superficial lymphatic vessels. If the infection reaches the lymph glands in the axillary space, abscesses frequently result.

If the infectious inflammation is not of a high degree the poison is eliminated from the system by the lymphatic vessels, thus avoiding collections of purulent fluid within the tissues. A

most serious, as well as a very painful attack of cellulitis, is met with in the tendon sheaths of the wrist and in the tough tissues forming the structures of the palm of the hand. The disease here is followed by edema and considerable swelling of the hand and forearm. Pain, restlessness, loss of sleep and disturbance of bodily functions, mark the successive steps of the morbid disease in its evolutions.

The treatment of cellulitis should constitute both local and general measures and, to accomplish the most good, must be active from the outset of the disease. Local measures consist of the application of the tincture of veratrum and echinacea, equal parts, over the inflamed area every hour or two with wet heat or cold, as best suits the individual case. Libradol or antiphlogistine, where the disease is deep seated; laudanum and witch-hazel, one part of the former to three of the latter; and menthol solution made by dissolving twenty grains of menthol crystals in eight ounces of alcohol. The efficiency of this solution may be increased by spraying it upon the part involved in the morbid action with a hand atomizer.

General measures should be commenced by first moving the bowels freely with some one of the saline laxatives and stimulating the kidneys to action by administering citrate or the acetate of potash in ten grain doses with lemonade as a drink. Feverish states, at the outset, may be greatly relieved with specific tincture of veratrum and gelsemium, small doses of acetanilid and salo sedatus. To modify the septic effect of the absorbed poison and prevent, if possible, suppuration of the lymphatic glands, potent doses of echinacea or echafolta and phytolacca should be given in alternation with the indicated sedative.

An extremity afflicted with cellulitis should be kept at rest in a moderately elevated position and snugly bandaged if the tissues are puffy and swollen. If the acute stage has passed when the morbid state is first brought to the surgeon's notice, and abscess formations are pending, the treatment should then be of a supporting nature; quinia, strychnia, iron, and the lime salts should be given in small doses and frequently repeated, nourishing fluid food may be partaken of freely, and the kidneys and bowels kept stimulated to action with the salines and the citrate or acetate of potash.

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Local collections of purulent fluid should be evacuated and the cavity washed out with peroxide and sterile water and subsequently dressed with antiseptic washes. Swollen and edematous states of the limbs require bandaging, and the part then kept at rest.

Pelvic cellulitis generally begins in the broad ligaments and extends to adjacent tissues. Peritonitis not infrequently appears as a complication and runs a very active course. If the inflammatory exudate is small in amount it is usually absorbed in three or four weeks, or it may break down into pus and later discharge into the bowel, bladder or vaginal canal, if it is not evacuated through an abdominal incision.

The symptoms indicating a marked case of pelvic cellulitis are increased temperature, rapid pulse, vomiting, pelvic tenderness and pain, restlessness, and wrongs of the functional organs of the body. An examination through the vagina will disclose a tense state of uterine adnexa in the early stages of the attack, and later a hard or fluctuating mass that may bulge into the upper vaginal canal.

The treatment at the outset of the disease should consist of remedies having an antiphlogistic effect, both local and general, Aconite or veratrum given in connection with bryonia, viburnum, dioscorea or other indicated remedies can be relied on during the acute attack together with external applications of Lloyd's libradol, turpentine and camphorated oil, or fomentation of hops and stramonium leaves with vinegar and water. To secure rest and promote sleep a suppository containing a grain of codeine should be given per rectum at bed time and repeated in four or five hours if required. Glycerine tampons inserted in the vaginal canal against the cervix uteri will deplete the pelvic tissues and lessen pressure pain that is present in the early stages of the disease. The lower bowel should be kept free of fecal matter by an occasional enema of glycerine and warm water.

As soon as it is discovered that suppuration has taken place the purulent fluid should be evacuated at whatever point it seems to determine, following which effective drainage must be kept up and the resisting powers of the patient sustained as heretofore advised.

ADHESIVE PLASTER DRESSING

As a ready, efficient and convenient surgical dressing to give support and fixation, nothing equals strips of adhesive plaster, and for this purpose it is now frequently employed in adjusting fracture dressings such as splints and other retaining apparatus; the immobilization of parts, especially fracture of the ribs; for strapping the joints in chronic inflammation, and the foot and ankle for a sprain and to give support to an incised wound both before and after the stitches have been removed. Its efficient use in the treatment of raw surfaces following a burn and other traumatic injuries as a cover dressing after the granulating sur- face has been asepticised is well established.

The diachylon and the oxide of zinc plaster is in common use for the purposes above mentioned, and can be purchased on spools of various widths and lengths.

In strapping the knee joint the adhesive strips should be about two inches wide and long enough to encircle the limb and overlap an inch or two. Commence below and extend the ad- hesive dressing upwards, applying the strips in such a way that when completed the dressing will resemble that done with the spiral bandage adjusted with the turns and reverses. Care should be taken to have the adhesive strips overlap each other at least half an inch as represented in Fig. I.
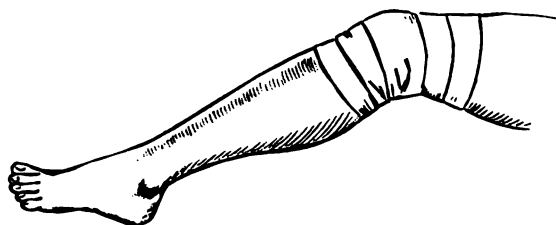
Fig. 1.

For strapping the foot and ankle for relief and support in case of a sprain and other injuries necessitating this form of dress- ing, the strips should be about one inch wide and long enough to reach from just back of the little toe along the lower border of the foot around the heel and a little beyond the middle of the inner side of the foot ; the strip should be applied with medium

tension and snugly adjusted by pressure. A short strip of the same width is now applied over the top of the foot, extending from the end of the strip on the inner side of the foot to the end of the strip on the outer side of the foot. The next strip is adjusted around the foot as was the first, overlapping the first strip fully one quarter of an inch. The third strip is applied across the top of the foot as was the second, overlapping the first transverse strip slightly and lapping on each end of the second lateral strip, and so on consecutively till the foot and ankle are covered in. If the

Fig. 2.

injury to the muscles and ligaments is extensive, a roller-bandage should be run on the foot and ankle over the strapping. Under this form of dressing the patient is generally able to put on his shoe and go about with but a slight limp. The foot and ankle with the adhesive-plaster dressing is well represented in Fig. 2.

As a retaining dressing in fracture of the bones of the leg

Fig. 3.—Strips of adhesive plaster fastened to the foot and ankle, by which extension is made in the treatment of fractures of the leg.

the adhesive strips are very efficient, especially where an extension stirrup or loop is to be provided for, as represented in Fig. 3. A strip of adhesive plaster two inches wide is applied to the outer and inner sides of the leg, extending from near the knee and passing across the sole of the foot loosely enough to form a loop three inches or more in length. A spiral bandage should now be run on the leg, commencing at the ankle and extending to the knee.

The adhesive plaster constitutes an efficient fixation dressing in the treatment of fracture of the clavicle. It is adjusted as follows; For an adult, a strip of plaster two feet and a half long will be required, and it should be three inches wide. Apply the plaster to the back of the arm, having it extend six inches above the elbow; split the strip at the elbow for four or five

Fig. 4.

inches, through which opening the point of the elbow extends; now flex the arm and bring the strip along the outer side of the fore-arm and back of the hand, and extend it on over the shoulder and securely fasten by pressing with the hand. The long strip should be securely fastened to the arm by a few circular strips of the plaster, or a roller bandage may be run on. See Fig. 4.

In the treatment of orchitis, either acute or chronic, prompt relief may be obtained by strapping the testicle with one inch wide strips of adhesive plaster as represented in the accompanying cut. The parts should first be shaved, washed and dried, when the swollen gland is grasped with one hand and slight traction is made while the first strip of plaster is adjusted around the spermatic cord and the upper end of the testicle. The next strip encircles the testicle and its scrotal coverings below the first

Fig. 5.   Fig. 6.

strip, and so on consecutively applying strip after strip till the swollen organ is enveloped. Two short pieces applied at right angles across the lower part of the organ complete the strapping.

The most effectual dressing that can be applied in the fracture of a rib or ribs is fashioned out of strips of adhesive plaster two inches wide and of sufficient length to reach from the sternum around the injured side to the center of the back or a little beyond. The dressing should extend above and below the fractured area for at least three inches.

There are many other uses to which the plaster dressing can be applied with great benefit, the importance of which will not be mentioned in this connection, but will be alluded to in giving the treatment of morbid states requiring this form of dressing.

ACIDOSIS—ACETONEMIA

Acidosis signifies an excess of diacetic and oxybutyric acids combined with acetone, in the blood, and just in proportion to

the excess of these ingredients in the vital fluid will be the intoxication noted in the functional activities of the body.

Individuals suffering severely from this morbid condition of the blood, will be stupid and drowsy and incapable of doing work requiring any great degree of mental exertion. The secretions of the system are strongly acid and the digestive function is perverted. The tongue and mucous membranes generally are redder than normal and the breath is usually foul, sometimes the odor is likened unto the smell of sweet cider and chloroform. The pulse is usually rapid and the respirations hurried. Cases attended with nervous agitation and delirium, early in the progress of the disease, generally pass later into a comatose state, then into collapse, death sometimes ending the scene in two or three days.

Acetonemia is frequently encountered in cases operated on for kidney trouble; it is thought to be due to the chloroform narcosis, especially when the fluids of the system contain septic matter of some nature.

In cases of some time standing, the features often assume a jaundiced hue, indicating degenerative changes in the liver. This morbid change of the fluids of the system following surgical operations, where the period of anæsthesia is prolonged, is now anticipated by the surgeon and every effort is made to avoid the morbid condition by expediting the operative work and eliminating the chloroform from the system as soon as possible, after the work is done.

Treatment: To support the vitality of the body and remove the excess acid from the fluids of the system, is the prime object in the treatment of acetonemia. If at hand, oxygen should be inhaled and the blood enriched and rendered less acid by the intravenous injection of normal saline solution, or a solution of bicarbonate of soda, four drachms to the quart of sterile water. The dosage may have to be repeated two or three times, at intervals of three or four days.

Internally, specific tincture of chionanthus, alternated with nux, will often act favorably toward relieving the marked jaundiced state that sometimes attends this morbid condition of the blood.

Uvedalia ointment applied over the liver and toasted in by

application of hot pads or hot water-bottles, will relieve tenderness and pain in the hepatic region. Little can be done with medicines in the worst cases of the disease. Individuals will eventually die of the acid intoxication.

REVULSION—COUNTER-IRRITATION

Resort is often had to the application of caustic remedies to the skin surface for the purpose of aborting or modifying local inflammatory action. The modifying effect is brought about through reflex action by stimulating the nerve terminals distributed to the skin.

Aborting inflammation is not alone the limit of the action of counter-irritants as they are frequently employed to relieve local pain and hasten resolution following severe inflammatory attacks. Agents that produce counter-irritation are divided into three classes, escharotics, vesicants, and rubefacients, and the severity of the action of each class is in the order named. Of the former the actual cautery is perhaps the most frequently applied to destroy malignant growths and for the relief of morbid states that result from chronic inflammation. Chromic acid in solution of the strength of one hundred grains to the ounce of water is applied locally to syphilitic warts and condylomata, lupus, nasal, polpi, tinea, and affections of a like character. If the severer caustic effect is desired, a paste is prepared by adding sufficient water to liquefy the crystals. Sulphate of copper, full strength, is a valuable escharotic as is butter of antimony for the treatment of cancerous ulcers. Vesicants are a severe form of counter-irritation and are frequently prescribed. Of the several common vesicating agents in use, cantharides in some one of its various preparations is usually the first thought of, either the cerate or the cantharidal collodion. Either of the two preparations employed should not be left in contact with the skin longer than five to six hours, when the agent should be removed and a poultice of slippery-elm or flax-seed applied for ten to fifteen hours. Owing to the serious constitutional effects of this agent in some cases, great care should be taken when applying it to the young or the very old, and in cases of nephritis and diabetes.

Rubefacients have a milder action than either of the other two classes of counter-irritants. Of this class, mustard is the most commonly used. The mustard plaster is prepared by mixing one part of ground black mustard with three parts of flour, adding sufficient vinegar to make a moderately thin paste, which is spread on cloth or paper and applied. The plaster should not be left in contact with the skin for a longer time than ten to thirty minutes; if necessary re-apply it later on. The turpentine stupe is an efficient counter-irritant and is frequently called into use in the treatment of inflammation of the bowels, peritonitis, and other morbid conditions of a like nature. The stupe is made by wetting a piece of canton flannel or flannel with the spirits of turpentine after it has been wrung out of hot water. The stupe can be left in contact with the skin for thirty minutes or one hour, being governed by the effect produced and the severity of the morbid condition for which the treatment is prescribed. In place of the stupe the spice poultice may be substituted, which is made of peppermint leaves, three ounces, ground cloves, ginger, allspice, and cinnamon, of each one-half to one ounce well incorporated and put in a gauze poke or bag which should be wet in hot whiskey or vinegar before applying. The spice poultice is of special benefit in the treatment of irritation of the bowels, pain resulting from inflammation, and colicky states attending irritating diarrhœa. A valuable counter-irritant for pelvic and abdominal inflammations, especially for children, is made by combining turpentine with camphorated oil in various proportions, usually three ounces of the former to two ounces of the latter. It may be applied every three to four hours, followed by cloths wrung out of hot water, or dry heat if desired.

BANDAGING

There are numerous varieties of bandages designed for the many surgical emergencies that mankind is continually subjected to, and to be able to properly adjust any one of them is a knack that few professional men in general practice can lay claim to. Much pain and discomfort have often been produced, and many

a limb has been sacrificed through ignorance displayed in properly applying the bandage dressing, hence a few general directions relative to the preparation of bandages and their uses will not be out of place in a work of this kind.

The material usually selected for bandages is linen, flannel, gauze, unbleached muslin, and India rubber. They are made of various lengths and widths and are used for the purpose of protecting and compressing a part as well as supporting the same. Bandages are also made use of to hold splints and other surgical appliances in place in the treatment of fractures and deformities.

The usual width for dressing injuries of the hands, fingers and toes, is about one inch, while the length will vary from two to four feet, according to the nature of the traumatism. For application to the extremities, bandages should be two and a half and three inches wide and two to four yards long; those for the head, two inches will be a convenient width, and the length about two yards. For the thigh and body, the width should be three and four inches, and the length eight to ten yards. Plaster-of-Paris bandages are made of gauze or crinolin and will vary from two to four inches in width and about twelve yards long, in the meshes of which is rubbed thoroughly dried plaster-of-Paris, the best of which is S. S. White dental plaster, put up in air-tight tin cans. Should a number of these plaster bandages be prepared and kept in stock, they should be placed in sealed tin cans, and before applying they should be put in a hot oven, after removing the cover, to drive off the moisture.

In preparing bandage material, the sizing should be first removed by washing the fabric in a soda solution; after drying it should be torn (not cut) into strips of the desired width and snugly made into rolls. A bandage roller is inexpensive and a great convenience to the surgeon who prepares his own dressings. A bandage cannot be snugly adjusted unless it is first properly rolled.

To apply a bandage to the limbs it must be started at the fingers or toes, where two or three turns should be made to secure the end of the strip; and as the process extends up the limb, diagonal turns and reverses will have to be occasionally

made on account of the conical shape of the part to be covered. Care should be exercised to make each turn of the bandage around the limb with the same tension that the circulation of blood be not impeded.

Gauze bandages, wet before applying, are to be preferred as a retaining dressing on account of their lightness and softness. Care should be taken not to apply it too tight as it is apt to shrink in drying.

Bandages made of rubber are easy to apply and are frequently made use of when compression is desired as in the treatment of sprains, varicose states of the legs, and tender and swollen conditions of the joints, but owing to the unpleasant sensation often experienced from adjusting the bandage too tight, and the heat that the rubber produces, make this bandage secondary to the flannel bandage which is light and sufficiently elastic to give both support and compression when this is desired. The object in applying the elastic bandage in varicose veins and ulcers, is to prevent a free flow of blood through the superficial veins by directing the blood current to the deeper veins.

To do a "bloodless" amputation of the extremities, Esmarche's rubber bandage is first tightly run on, commencing at the foot or hand and extending it above the selected point of operation a few inches, where the rubber cord is applied by encircling the limb two or three times and securely tying it.

Starch and plaster-of-Paris bandages are applied when immobilization of a part is desired, as in the treatment of fractures, especially in children and others, who for one reason or another may be mentally irresponsible for their acts. They are also employed in the treatment of deformities, such as bow-legs, and weak, tender and distorted joints. Before applying a plaster-of-Paris bandage, it should be set on end in a basin of quite warm water in which a little salt has been added, and should not be removed until the air-bubbles cease to be thrown off when it should be run on as rapidly as possible, rubbing each layer of the bandage to adjust it well to the contour of the limb, and to eliminate any pent-up air that may be confined between the layers of the bandage. Before adjusting a starch or plaster-of-Paris dressing, the part to be covered in should be

first covered with a light flannel bandage. Care should be taken not to make the plaster dressing too thick, and that it be applied without too much tension; also observe that the part to which the plaster is applied be held in the proper position while the dressing is setting. If a plaster dressing be adjusteo too tightly to a part of the extremity, the distal part, especially the toes and finger tips, will become purplish in color; the cast should be at once sawed longitudinally and spread slightly after which it may be sufficiently tightened with strands of muslin thrown around it and tied. In case of an ulcer or an open wound that needs dressing, a "trap-door" opening should be made in the plaster dressing after it is applied, that this work may be done.

A sling is an improvised retaining dressing, made by many turns of a four-inch muslin or flannel bandage, or from one piece of muslin a yard or more in length and a foot to twenty inches in width. This form of bandage is utilized in the treatment of injuries to the arm and shoulder, such as fractures of the clavicle, coracoid and acromoin processes, and neck of the scapula, and fractures of the radius and ulna, and other traumatic injuries which require support to give relief from pain. These bandages are suspended from the neck, back of which they are tied or pinned, forming a wide loop in front, in which the hand and forearm rest.

The many-tailed bandage is a convenient over-dressing where a part requires frequent cleansing and re-dressing. It may be made by two methods; one is to take a piece of muslin of the desired length and width, to which are sewed transverse strips of the same material of the required length; the other method is to take a piece of muslin or flannel of the desired length and in width once and a half of the circumference of the part to which it is to be applied. Strips are to be torn transversely from both lateral edges two inches wide and of the desired length to be tied or pinned about the limb. In either case the tails are folded over the dressings and pinned or tied from below upward, as in this way the bandage can be better adjusted to the shape of the limb.

The T-bandage is made of two strips of fabric, one of which should be from three to four inches wide and of sufficient length

to encircle the waist above the hips: the other strip is usually
from two to three inches wide and is pinned or sewed to the
horizontal or circular piece at about its center and in applying
it this vertical piece is brought through between the limbs and
fastened to the circular strip in front with a safety pin. This
form of bandage is employed as a retaining dressing to the
perineal and sacral regions.

The many kinds of bandages are named according to their
mode of application; hence there is the spiral, oblique, circular,
recurrent, and spica in most common use. They are also
named according to their shape and the figure they resemble
when applied; thus we have the T-bandage, the many-tailed
bandage, the V-bandage, and the figure-of-eight bandage. Then
there is the triangular bandage, made by folding a large hand-
kerchief or square pieces of muslin or other fabric of various
sizes in the form of a triangle, used largely in military sur-
gery and for numerous injuries where it is not required to
make smooth regular pressure. The triangular bandage is em-
ployed as a retaining medium in injuries to the gluteal region.
If required, one can be used on each side; the ends are fastened
to a circular bandage about the waist. This form of bandage
is also employed to support the scrotum when fashioned into
a shape like a sling and fastened to a belt about the body.

A towel makes a convenient and efficient bandage to be
adjusted to the chest in the treatment of fracture of the ribs, and
other morbid states requiring support and a restraint of motion
during convalescence.
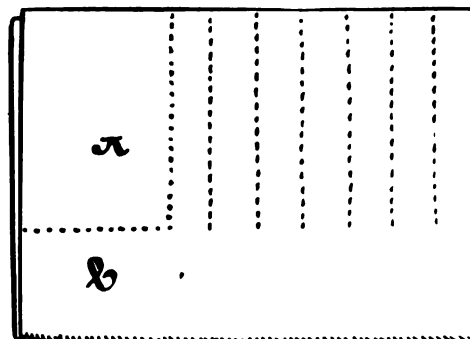
Fig. 7.

The most satisfactory finger bandage utilized for dressing bruised and mangled fingers is made as follows: Take a piece of fabric twice the length of the finger and cut it square; fold the cloth double, as in Fig. 7. Cut out the square marked (x) and remove it, then cut in from the side to about the center of the cloth six or seven tails, as shown by the dotted lines in the cut; the bandage is then opened and placed in position as represented in Figure 8. The flap (b) is then turned
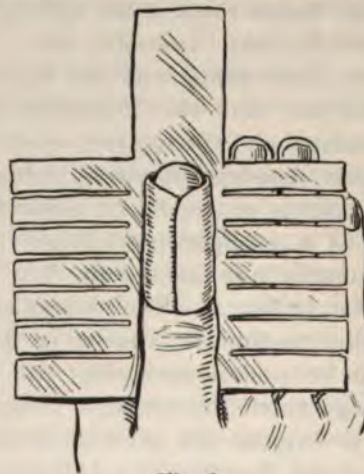
Fig. 8.

down over the finger and any antiseptic dressing that may have been previously applied, over this tie the adjacent set of tails once and adjust the ends along the line of the finger, then tie the next set of tails inclosing the ends of the first set of strands as shown in Figure 9, and so on until all the strands are tied, the last being pinned or tied in a double knot.

Fig. 9.

SURGICAL DRESSINGS

A surgeon should have at hand and ready for use in emergency cases and operations in general, sterile bandages and dressings of various sizes, including towels, pads, gowns and sheets. The material from which bandages, sponges and pads are made should be first washed in soap and water and dried in a hot oven; after being made into the required dressings they are to be placed in a folded napkin and subjected to steam heat for one hour; they are then placed in sterile jars ready for use.

To render cotton-batting absorbent, it should be boiled in a two per cent. soda solution for thirty minutes, the water is then drained off and the cotton dried by baking in a hot oven.

To render gauze antiseptic, it is subjected to an immersion bath of the desired chemic solution for from twelve to twenty-four hours; drain off the mixture and keep the gauze in closed jars. In this way large quantities are usually prepared and kept in stock.

The following formulas are recommended for the preparation of antiseptic gauze now in common use.

Carbolized Gauze:

℞.
  Carbolic Acid .... ℥ j and gr. xl
  Carbonate of Soda .... ℥ ij
  Sterile Water .... gal. s s

Boil the gauze (usually ten or twelve yards) in this solution for thirty minutes, thoroughly rinse in sterile water, drain and dry in a sterilizer or oven.

Bichloride Gauze:

℞.
  Bichloride of Mercury . ... ℥ ss
  Chloride of Sodium .... ℥ j
  Glycerine .... ℥ ij
  Sterile Water .... gal. s s

Immerse the quantity of gauze required in the above solution for twenty-four hours, rinse well in sterile water and drain; keep stored in sterile glass jars.

Iodoform Gauze:

℞.
Carbolic Acid .... ℥ j
Glycerine .... ℥ ij
Alcohol ....
Sterile Water, āā.................................. ℥ xij

Into this mixture thoroughly incorporate two ounces of iodoform in a granite basin in which place six to eight yards of sterilized gauze, using a glass rod to aid in the immersion; after the fabric is thoroughly saturated, the excess fluid should be allowed to drain off, when the gauze should be packed in sterile jars.

Permanganate gauze is in great favor with many surgeons for dressing suppurating wounds and malignant ulcers, on account of its deodorant properties. It is prepared as follows:

℞.
Permanganate of Potash .... ℥ j and gr. xl
Glycerine .... ℥ ij
Sterile Water .... gal. s s

After ten yards or more of gauze have been rendered sterile by boiling in sterile water for one hour, the fabric is immersed in the above solution for twenty four hours. The excess fluid is allowed to drain off, when the gauze is placed in wide mouthed jars till used.

Subiodide of bismuth gauze:

℞.
Subiodide of Bismuth .... ℥ xx
Glycerine .... ℥ iss
Sterile Water .... ℥ ix
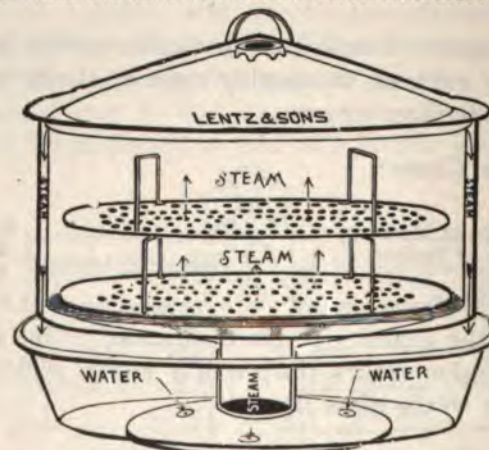
Fig. 10.—Arnold Steam Sterilizer.

Thoroughly wash five yards of gauze in soap and hot water, rinse in sterile water and dry in a sterilizer or hot oven; then place in a sterile granite basin and pour over it the above mixture and stir until thoroughly saturated. Gauze treated in this manner makes a safe and efficient dressing for surface wounds.

Arnold's steam sterilizer (see cut) answers the purpose well, besides it is cheap and convenient. It should be made of copper and large enough not only to sterilize bandages, and gauze dressings, gowns and aprons, but trays, basins, and flasks in which solutions are placed for special uses, as for the sterilization of normal salt solution.

MEDIUMS FOR DRAINAGE

A difference of opinion prevails among surgeons of extensive experience in operative work, regarding the necessity of placing mediums for drainage in abdominal operations, or other wounds septic in character and otherwise serious.

It has not been many years since the wound of an abdominal section was left partly open at its lower angle, through which a gauze drain or a glass tube was introduced and extended well down into the abdominal cavity to drain off bloody and septic fluids that accumulated after the operative work was executed. This course is not generally followed today; extreme septic conditions may demand the procedure, but surgeons who look well after the antiseptic technique of their operative work have learned to rely, to a great extent, upon the ability of the absorbent vessels to dispose of the waste and even septic fluids, hence they close the abdominal incision and prescribe remedial agents and such hygienic measures as will support the patient's strength to enable him to resist the impending infection.

In the author's practice extending over thirty years, most of which time has been in hospital service, much dependence has been placed on thorough drainage in septic cases, especially where the general condition of the patient manifests but little resisting power and rarely has he observed other than the most gratifying results, other conditions of the patient being equal. Cases demanding most thorough drainage are parovarian abscess-

es and purulent collections forming in the appendix and Fallopian tube. After operative procedures for the former and latter conditions in the female, thoroughly and reasonably safe drainage may be established through an opening in Douglas cul-de-sac, while appendectomy operations should be drained through the right inguinal region.

It is true the glass and rubber tubing and other common mediums for drainage utilized in dressing deep wounds and cavities permit of the entrance of germ-laden air, besides the possible introduction of other forms of sepsis by the frequent changing of these agencies, yet the risk of increased infection from these sources should be compared with the result of the possible formation of pockets of purulent fluid following extensive operations where no provision for drainage was made.

The very nature of the individual case must decide at the time the operation is executed whether or not drainage should be provided for and the safest means of employing it.

The common mediums made use of for drainage are **glass tubes** of various lengths and sizes, some straight and others curved at one end, sufficiently heavy to prevent breaking and perforated at the end to be introduced (see accompanying cuts);

Fig. 11.—Various kinds of Drainage Tubes, made of Soft Rubber and Glass.

and **rubber tubing** cut of a sufficient length and of suitable size to fulfill the purpose for which it is required. A suitable number of eyelets should be made in the end to be introduced with

scissors, first bending the tube sharply upon itself, then snipping off the angle. The wick or gauze strand is employed for capillary drainage in abdominal wounds principally. The material should be thoroughly sterilized and one end placed deep in the ventral cavity while the distal end should be passed through a glass tube which extends through the incision in the abdominal wall.

In removing the drain it should be done through the glass tube to prevent soiling the tissues along the incised opening in the wall of the abdomen. The glass tube can be removed at this time or at a later date as the patient's condition will direct. The exposed end of the glass tube should always be enclosed in several thicknesses of bichloride or other antiseptic gauze, to prevent the entrance of dust-laden air.

The **cigarette drain** can be used to good advantage to drain cavities and deep flesh wounds. It is made by enclosing a little roll of sterile gauze within an envelope of rubber protective tissue, or in the place of the rubber tissue, a piece of thin rubber tubing may be employed. This form of drainage has an advantage over the glass tube, as it is soft and yielding and does not produce pressure, irritation and pain.

In removing drainage mediums of any kind it will be well to rotate them several times before withdrawing them to avoid pain and irritation to raw surfaces.

Abscess cavities about the face and neck may be drained after they have been opened with pieces of **catgut** or **silk-worm gut** twisted together into a little strand and left extending from the angle of the wound. In the absence of silk-wormgut or cat-gut, **horse-hair** may be utilized for the same purpose.

When glass or rubber tubing is used for the purpose of drainage, the outer end should be secured with thread stays, safety pins, or strips of adhesive plaster to prevent the tube from slipping into the cavity being drained.

The length of time a drainage tube should be left in place will be determined by the nature of the wound or cavity to be drained, usually it can be dispensed with in two or three days; septic cases will require much longer time.

LIGATURES, SUTURES AND SUTURE MATERIAL

Suture material is made from silk, catgut, kangaroo tendon, silk-wormgut, horsehair and silver wire. Horsehair, silk and silver wire may be sterilized by boiling thirty to forty minutes and kept in dry sterile stock bottles or in a solution of carbolic acid, 1-20, or in pure alcohol. Silk-wormgut is usually sterilized as needed and is done by clipping off the frayed ends of a dozen or more strands folded once and placed in a sterile glass tube, which should be plugged with non-absorbent cotton and placed in an Arnold steam sterilizer and subjected to the steam heat for one hour the first day, and a half hour on the next two succeeding days; they should then be placed in absolute alcohol till used.

It has been claimed by some operators that stitch abscesses seldom follow the use of sterilized silver wire as sutures, as the metal has a potent antiseptic effect upon the tissues; if this is true it should come into more general use. It can be obtained in graduated sizes on spools and can be sterilized by wet and dry heat. Boiling in a one per cent soda solution renders it fit for use. It has no special advantages over silk-wormgut, if the latter is properly prepared. Catgut, both plain and chromicized, makes the ideal suture material if properly sterilized. There are several methods by which this is accomplished, the one here given being as reliable as any known process up to this time. Plain catgut of the required length (usually two or three feet long) is wound on glass spools or reels, several of which are placed in a glass tube filled with pure alcohol and boiled in a water bath for one half hour on three successive days. The reels are then removed and placed in oil of juniper berries for one week and then placed in absolute alcohol until used. It will be well to amply fill the glass tube with alcohol before boiling to provide for evaporation while in the water bath.

Chromicized catgut is used when it is desired that the sutures hold for a period of twelve to sixteen days; it is prepared as follows; plain catgut is selected with care and boiled in alcohol as in the previous case, for one half hour, it is then placed in the following mixture for three days:

℞.
    Carbolic Acid .... ℨ ij
    Chromic Acid .... gr. vj
    Alcohol .... ℥ x
    Aqua. Dest. ....fl. ℥ xiv
M.

Wash the catgut in pure alcohol on removing from this mixture and place in glass-covered jars, in absolute alcohol, till ready to use. The material will be more pliable if placed in a 1-20 carbolic solution for one half hour before using.

Kangaroo tendon is not in general use. Its use was highly praised in hernial operations, but it has no advantage over chromicized catgut and is much more expensive. It can be obtained in stock in glass tubes ready for use.

Catgut is also prepared for use by immersing it in a 1-500 strength solution of bichloride of mercury in alcohol, where it should remain a week or ten days, the period of time will depend on the size of the gut. The catgut should be placed in pure ether for twenty-four to thirty-six hours previous to putting it in the mercury solution, to dissolve the fat that the fresh gut contains. The principal objection to preserving catgut in mercury solution is the brittleness of the material following its treatment in the potent antiseptic. The value to be attached to any one of the varieties of suture material mentioned depends on the technique of preparation and its freedom from infective germs up to and during the time of its use.

A suggestion relative to applying sutures and ligatures may not be out of place in connection with what has been said regarding the several methods of their antiseptic preparation:

• The wounds of minor degree should be closed with plain sterile catgut, the needle entering one-eighth to one-fourth of an inch from the margin of the wound, engaging the skin and fascia on either side. The suture placed, it should be tied just tight enough to approximate the edges of the wound without undue constriction of the tissue. The same course should be pursued with deeper wounds, except the sutures should include more tissue to withstand the strain imposed on the intervening portion during the period of the healing process.

Care should always be taken to prevent sutures or ligatures coming in contact with non-sterilized objects after leav-

ing the sterile trays or retainer while being passed to the operator. The surgeon should also pay due care not to subject the strands of material to infection after they reach his hands and while being placed in position.

In removing sutures it is advisable to seize the presenting part with dressing forceps and make slight traction and snip one side of the loop with scissors close to the skin, when with a sudden jerk of the loop held in the grip of the forceps, it is removed with little chance of stitch-hole infection and little pain. Ordinarily, sterile catgut sutures become absorbed in a week or ten days, and silk-wormgut or silk strands should be removed at about the same period of time, unless the sutures are approximating margins of wounds with retained drainage material.

Braided silk ligatures of various sizes are used to constrict the pedicle of abdominal tumors and are not infrequently discharged, after varying lengths of time, through ulcerative process through the walls of the abdomen, bowels, or bladder. The constricting medium may not always be disposed of in this manner. It may be retained around the stump indefinitely. Especially should the strand engage portions of the pedicle while being placed, to prevent slipping. The author did a laparotomy on a lady to break up post-operative adhesions, when he found a braided silk strand in an excellent state of preservation, intact with the stump of a cystic tumor removed three years previously.

Surgeon's Knot

A ligature, to hold securely when applied around a pedicle or other mass of tissue, should be tied with a surgeon's knot, which is formed by passing the end of the ligature under twice in the first loop, instead of once, as in the reef or granny knot; the second half of the knot is made with a single turn. (See cut).

The surgeon's knot is to be employed in the ligation of blood-vessels, especially in those cases where the surgeon cannot see the progress of his work as the knot will not slip if properly tied, hence lessening the chance of secondary hemorrhage.

It will be well for the physician who only occasionally performs operations, to practice tying this form of knot, that he may become dexterous in the successive steps in tying it. In
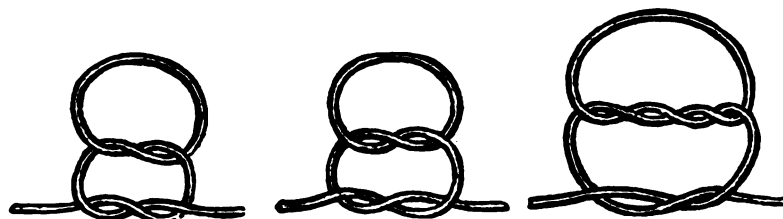
Fig. 12.—Square Knot.   Fig. 13.—Slip Knot.   Fig. 14.—Surgeon's Knot.

tightening the first loop, care should be taken not to allow any portion of the loop to become doubled, otherwise the knot will be improperly tied and the loop will easily slip from its anchorage.

The reef knot can and is used in minor superficial operations, in closing wounds with either catgut or silk, although the former cannot be as securely tied as the latter; but fine catgut is soon absorbed and seldom leaves stitch scars.

The Staffordshire knot is still in favor with many surgeons in constricting large pedicles. Braided silk is preferred for the constricting medium, as a great amount of force can be dis-
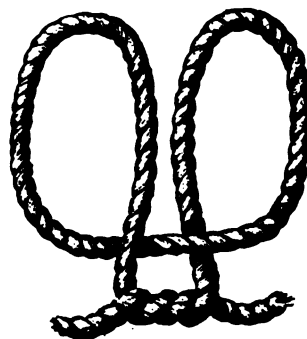
Fig. 15.—Staffordshire's Knot.

played upon it in ligating large masses of tissues. The ligature is passed through the pedicle with the aid of a large needle, which is returned back through the pedicle, leaving a loop on the oppo-

site side of the mass; the loop is then brought over the tumor to the proximal side, and the ends of the strand are carried, one above the other, below the center of the loop, and securely tied. (See cut).

Different Forms of Sutures

There are several methods of introducing sutures, each having some feature to commend it in the closing of operation and other wounds. The interrupted and continuous forms are the most commonly used, although the pin and figure-of-eight sub-cutaneous, quilled, Lembert's, quilted and Halstead's sutures are used in special operations, to be named hereafter.
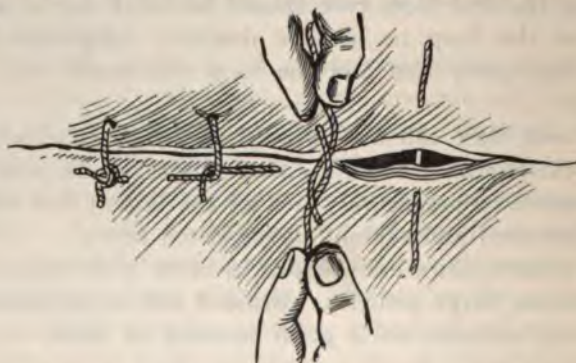
Fig. 16.—The illustration shows the successive steps in the introduction and tying of interrupted sutures.

The interrupted suture (Figs. 16 and 17) is made by carrying each stitch across the incised or other wound and tying without undue traction. The nature of the wound will determine the number and the distance apart they should be placed.

Fig. 17.—This illustration shows interrupted sutures as they are generally tied, with the knots resting on the line of incision. This is wrong. The knots should rest to one side of the line of incision.

The continuous suture (Fig. 18) differs from the interrupted form in that the first stitch is taken near one end of the wound and after tying, the suture is passed through the opposing

Fig. 18.—Continued suture. (*Brown*)

edges of the wound by the aid of the needle, one-half inch or more apart, over the entire length of the incision, tying the last stitch, made in like manner as the first.'

The pin or figure-of-eight suture is used in hair-lip, and other similar operations upon the surface of the skin. It is formed by transfixing the margins of the wound with pins or needles after they have been approximated, around each end of which, and across the wound, the strand is placed in a figure-of-eight form, and secured by tying. The nature of the wound will determine the number to be placed.   After all are secured
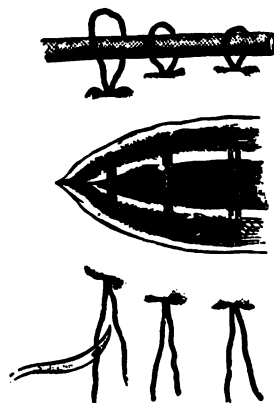
Fig. 19.—Quilled suture. (*Smith*)

the ends of each pin or needle should be cut off with pliers close to the encircling strand. If properly placed, this form of suture checks hemorrhage and leaves no stitch-scar.   They should be removed in from three to five days and the wound

dressed with narrow strips of adhesive plaster. The quilled suture (Figs. 19 and 20), used mostly in closing deep wounds, where more than the ordinary force is required to hold the margins in apposition, is composed of a double strand passed through the

Fig. 20.—Quilled suture tied. (*Smith*)

opposed margins of the incision at the required depth as for interrupted sutures, passing a quill or a section of a small bougie through the loop on one side of the wound, and tying the ends of the strands over a like section on the opposite side.

Fig. 21.—Suture of the intestine. Interrupted Lembert sutures in place.

Lembert's interrupted suture (Figs. 21 and 22) is used principally in repairing wounds of the intestines. They should be placed about one-fourth of an inch apart, and should be inserted

Fig. 22.—Lembert sutures tied.

one-fourth to three-eighths of an inch from the margin of the wound of the intestine, the middle strand being placed first, those on

each side following. After each of the sutures has been tied, and the ends clipped close to the knot, the wound should be cleaned and the intestine returned to the abdomen and drainage provided for, if the nature of the case demands it.   Iron dyed silk should be used for sutures.

Quilted   sutures   are   something   after   the   nature of interrupted sutures, and often used in the closure of wounds instead of the latter.   It will be observed the suture does not pass over the margins of the wounds as in the interrupted form.
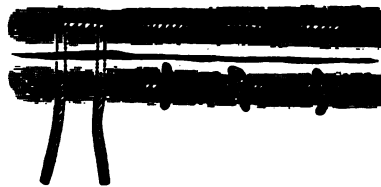
Fig. 23.—Quilted mattress suture, interrupted.   (*Brewer*)

The Halstead quilted suture (Fig. 23) is preferred by many operators to Lembert's for closing wounds in the intestines. Iron dyed silk is recommended for this purpose.   The suture is passed through a small portion of the muscular coats of the bowel about one-quarter of an inch on each side of the margin of the wound and returned in like manner to near the starting point and tied.   The middle suture should be passed first.

The sub-cutaneous   suture   is   recommended   in   the closing of wounds on the skin surface to avoid stitch scars and infection from the germs that find lodgment upon the surface of the integument.   The needle armed with the ligature is introduced in the sub-cutaneous tissue near the end of the wound and made to pass out just beneath the edge of the wound on the same side, the same kind of stitch is taken on the opposite side, but a half-inch or more in advance of the previous one, the others are taken in like manner till the end of the incision is reached, when by making traction upon each end of the strand the margins of the wound are approximated.   The application of a few narrow strips of Z-0 plaster will aid in holding the

edges of the wound together.   This form of suture is especially recommended in abdominal incisions.

TISSUE PRESERVATIVES

For the preservation and hardening of pathological specimens for chemical and microscopical examination, various chemical solutions have been suggested, chief among which are alcohol, formalin, and corrosive sublimate.   The former is often used in graduated strengths, varying from fifty to one hundred per cent, the latter being used principally for hardening specimens for examination.   A ten per cent solution of formalin in water will preserve tissue indefinitely and usually without much change in appearance.   A fifteen per cent solution is more frequently used to preserve the large organs of the body, as the liver, spleen and stomach.

Bichloride of mercury in dilute alcohol (x gr. to 80 per cent alcohol ℥ xx) is used for the preparation of tissue for cell study with the microscope; after the specimen has remained in the corrosive solution for twenty-four hours it should be washed with water, and then in dilute alcohol to remove any excess of the mercury.

Fleming's solution is a reliable preparation for the preservation of specimens for cell study.   It is composed of the following agents:

R.
    Chromic Acid (1 per cent) .... ℥ iv
    Osmic Acid (2 per cent) .... ℥ j
    Glacial Acid .... gr. xvj
M.

The specimen should be immersed in this fluid for twenty-four hours after which it is placed in running water for another twelve hours to prepare it for examination.

If it is desired to support the tissues by embedding, two processes may be utilized; the specimen may be placed in a celloidin solution, prepared by adding equal parts of absolute alcohol and ether, two ounces, celloidin, one-half ounce.   Before placing the specimen in this solution it should be kept in absolute alcohol for twenty-four hours to drive off the moisture.

After remaining in the embedding solution upwards of twenty-four hours, it should be removed to a heavier solution made of the same ingredients for twenty-four hours longer.

℞.
    Celloidin .... ℨ j
    Alcohol ....
    Ether, āā .... ℥ ij
M.

After removing the specimen from this mixture it should be allowed to soak in dilute alcohol (80 per cent) for one hour.

To prepare a specimen for an immediate examination it is first placed in dilute alcohol (80 per cent) for a short time, then a mixture of paraffin and tallow, two parts of the former to one of the latter, is moulded about it before cutting sections with the microtome or razor.

To prepare a specimen of the brain, cord, nerves and eyes, Muller advises that they be immersed, for three or four weeks, in a fluid composed of the following agents:

℞.
    Potassium Bichromate .... gr. xl
    Sodium Sulphate .... gr. xvi
    Water .... ℥ iii and gr. xx
M.

LEECHING

The abstraction of blood by applying leeches is frequently resorted to in local inflammatory states, where operative procedure with the knife is impracticable. They are frequently called into use by many physicians in treating acute inflammatory conditions of the eye and ear, resulting from traumatism, or acute catarrhal states.

There are two varieties of leeches used for local depletion; the American and the Swedish. The American leech is the smaller of the two varieties, and will abstract about a large teaspoonful of blood; while the Swedish leech will draw three and sometimes four teaspoonfuls. To keep them healthy and ready for use, they should be placed in an open glass jar nearly filled with fresh water, which should be changed once a day.

Previously to applying them, the skin should be prepared by first washing the surface with soap and water, dry thoroughly, and moisten the skin with milk, or a little blood; if they are slow to take hold or are inclined to move around, confine them to the selected area by placing a small inverted tumbler over them. To loosen them after they have filled themselves with blood, sprinkle a little salt on them. Should the wound produced by suction of the leech continue to bleed after its removal, apply a compress previously wet in some astringent mixture as Monsel's solution of iron, or adrenalin chloride one to one thousand. Blood may also be abstracted by first scarifying the selected area, and applying a glass cup to which is attached an exhausting air-pump.

The treatment of inflammatory states by leeches is not popular with the masses, and it is not in common use in modern practice.

VALUE OF HEAT AND COLD AS A LOCAL APPLICATION

It is a well known fact that the application of ice to any part of the surface of the body will bring about a marked contraction of the blood-vessels in and near that structure. Possessing this knowledge the surgeon frequently has occasion to prescribe this agent for the relief of inflammatory states, pain, acute swellings, and hemorrhage from superficial structures.

Ice broken into small bits and put in a rubber cap or bag is the usual form in which this agent is locally applied. The part to be treated should first be enveloped with a thin layer of flannel or other soft fabric to prevent too severe injury to the integument. In congestion of the brain and its envelopes the ice coil is a useful device through which cold is applied by draining through it ice-water from an elevated receptacle. This method of applying cold can be employed for the relief of inflammation following injuries to the limbs and various parts of the body.

Cold can also be applied for local depletion by directing a small stream of ice-water upon the affected part from an

elevated position, and by compresses frequently wet in ice-water. The latter method is frequently resorted to in the treatment of orchitis, and swellings about the eyes.

.Care should be taken not to do severe injury to weak and enfeebled parts, as extensive sloughs and even gangrene have resulted from the careless use of ice-cold applications.

The local application of the various forms of heat is frequently employed in the treatment of numerous surgical affections. Water heated to a temperature of 115 to 140 degrees F. will readily control hemorrhage from the skin and muscular tissue when applied with a small compress. If locally applied at a temperature a little above that of the body, hot water is a valued agent in controlling inflammatory states. Compresses are soaked in hot water having a temperature of 100 to 102 degrees F., and locally applied; and to be effective they must be kept hot by frequently changing them.

Hot sterilized solutions are in constant use in the treatment of all forms of traumatic affections, and in the preparation of the patient for surgical operations. Neuralgic and post-operative pains usually yield to the application of compresses wrung out of comfortably hot water, as does the itching accompanying some of the inflammatory forms of skin affections. For the latter purpose a hot solution of the alkaline antiseptic, or other medicated washes that may be indicated, can be applied as hot as it can be comfortably borne.

Small nevi, or "mother's mark" can be removed by making numerous punctures in the superficial structure of the morbid mass with a coarse needle heated in an alcohol flame to a red heat, and larger malignant growths are obliterated with the actual or thermo cautery; the latter should be used at red heat only, when employed to arrest hemorrhage, and then the bleeding surface should be compressed for a moment with a gauze pad to dry it in a measure, after which quickly apply the cautery. The soothing effect of hot water can be readily obtained when needed to relieve painful states by adjusting the rubber coil to the affected area and directing a flow of the heated fluid through it, or, as many prefer, by means of the hot-water bag. The heated salt or sand bag is not without its merit in painful conditions. It is well to interpose

pieces of flannel between the hot-water bag and the part to which it is applied to prevent injury by burning; especially is this precaution necessary in treating a patient when suffering from shock, or when paralyzed; also should he be in a state of unconsciousness.

White heat applied through the medium of the galvano-cautery is utilized in removing polypi and operating in deep cavities. For use in this kind of work, electrodes are fashioned in the shape of loops, blades and probes.

To restore the circulation to a feeble part, and to relieve pain, or reduce inflammatory action, in freeing a part from sloughs, and treating septic wounds, heat is employed in the form of fomentations, poultices, baths and douches. Fomentations are made from various materials, such as hops, stramonium leaves and tansy, put in a sack or pouch made of muslin or cheese-cloth and dipped in hot water; or by pads of soft fabric, soaked in some antiseptic solution. Poultices are made of slippery-elm bark, flaxseed, bread and milk, and should be kept moist by wetting in some one of the potent antiseptic solutions. A hot bath is of special value in the treatment of a sprain or bruised injury to the joint. For this purpose the water should be used at a temperature of 100 to 115 degrees F.

The douche is utilized to flush out cavities and wounds. The fluids which may be plain sterilized water, or some antiseptic mixture may be directed to a part through the medium of a fountain syringe, pitcher, or a regular douche-bag. The temperature of the water designed for douching the vagina to reduce inflammatory action or control hemorrhage, should range between 110 and 115 degrees F. and this degree of heat should be graduated with the bath-thermometer and not trusted to the hand. It is always advisable for the patient to remain lying upon her couch or bed for an hour or two following a douche that she may recover from the temporary weakness usually experienced following this form of treatment. The amount of fluid usually required for a douche, is from three to five quarts.

BURNS AND SCALDS

A part coming in contact with intense heat, receives an injury of greater or less severity that is denominated a burn or scald. These injuries are received in numerous ways, boiling water and steam, being, perhaps, the most common medium. That of coal oil and gasoline may rank next in order.

For the sake of convenience, this form of injury has been classified into the first, second and third degree, each having reference to the extent of the local and general disturbance received. In burns of the first degree, there is present hyperæmia, erythemia, and slight inflammation of the skin without vesication. In the second degree there is inflammation with the formation of vesicles and bullæ, while in the third degree the injury extends through the skin and superficial fascia to deeper structures beneath, and may be so severe that complete carbonization of the part may result.

Following the reception of a burn, should there be symptoms of shock, it must receive prompt constitutional treatment, as the danger from collapse is great; here hypodermic injections of strychnia, one-sixtieth, or brandy, one drachm, are indicated and should be repeated every thirty minutes, or given in alternation until recovery is assured. If shock is likely, the result of intense pain, anodynes are demanded; one-sixth grain of the hydrochloride of heroin, or one-fourth grain of morphine, should be given endermically and repeated in two hours if needed; age, of course, should limit the dose as to size and frequency.

The local applications should be such as will reduce inflammatory conditions, and exclude the air. For burns of the first degree, cloths wet in soda solution, the biborate being preferred, kept ice cold, covering well the affected part, will be all sufficient, especially if the cold solution be constantly poured on the dressing while the irritation of the integument remains. The following mixture will be found of great value to relieve pain, prevent sepsis, and promote healing, as well as removing soreness and inflammation:

R.
    Campho-Phenique .... ℥ iss
    Lanolin .... ℥ iii
  M. Sig.—Spread over the inflamed area to a depth of one-

fourth inch, apply a compress and bandage lightly; redress in twenty-four hours.

Lloyd's Libradol, if at hand, will be the most efficient local application at our command; it should be lightly spread over the injured part and lightly bandaged; redress in eight to ten hours.

The alkaline solution, and the Campho-phenique mixture will be found serviceable in burns of the second degree, commencing with the former during the acute stage, following with the latter after a few hours; after the application of either, cover the region with gutta-percha tissue, over which keep a stream of cold water running till the inflammatory action subsides, when the treatment should be continued with gauze pads, wet in the soda solution previously mentioned; or dust the injured part with equal parts of acetanilid and subnitrate of bismuth, re-dress every six hours. At the outset, all vesicles should be snipped with scissors and their contents discharged.

Burns of the third degree, if limited in extent, are treated as are those of the second degree; when extensive, remove shreds of loose cuticle, irrigate with the soda solution, and when possible, immerse the part a few minutes at a time, keeping the solution cold by the addition of ice. The normal saline solution is useful here, and can be applied on gauze pads as well. The acute symptoms subsiding, dress the wound with the Campho-phenique mixture liberally once every twenty-four to forty-eight hours, or a ten per cent mixture of phenic acid in olive oil twice a day. During cicatrization, prevent deformity by position, the use of splints, or other necessary mechanical appliances. Should sloughing result and the gaping wound become a slow healing granulating surface, resort to skin grafting will be demanded. Brief directions for the procedure are as follows: The granulating surface should be thoroughly cleansed, morning and evening, with a weak solution of bichloride (1 to 5000), for twenty-four hours, a gauze pad is then applied and kept wet with the alkaline antiseptic solution. This treatment should render the wound aseptic and quite free from discharges, which is essential to success. Irrigate the surface just before applying the grafts with the normal saline solution, care being taken not to wound the granulations to cause hemorrhage.

The part from which the grafts are taken should be washed

with soap and water, then with the bichloride solution (1 to 1000), and lastly the saline wash. The grafts are generally taken from the leg, thigh, or arm. When every antiseptic precaution has been taken, shave off strips of skin of suitable size, and apply to the surface of the wound without touching it with anything likely to infect it, preferably using a keen edged razor to raise the grafts; should the edges of the grafts become turned under before reaching the prepared surface, float them out with the normal salt solution. After a sufficient number have been placed, strips of rubber tissue having been previously treated in the salt solution, are applied' over the surface, and over them gauze pads which have been well sterilized, and over all a bandage is run on. The tissue protects the newly formed skin surface, and the wound is not irritated by the removal of the dressings.

By the above method of procedure, skin grafts may be removed three inches long and still retain active vitality. The grafts should be cut very thin, only containing the epidermic layer. If everything does well after the operative procedure, the dressing should not be molested for three or four days, when the bandages and the gauze pads may be removed; the latter should be thoroughly wet before removal, that no harm may be done the new tissue. If possible, the gutta-percha strips should be left unmolested; however, the granulating surface can be carefully irrigated with the normal saline solution, and then redressed as at first. After-dressings should be with antiseptic washes.

RUBEFACIENTS

Rubefacients are a class of remedial agents that, when applied to the surface of the skin, may produce an active irritation of that tissue. This form of treatment is utilized for the relief and cure of deep seated pain when due to irritation,inflammation, or congestion of internal organs.

Hot water sponged over the region of pain will redden the skin and cause a determination of blood to the surface. A folded compress wrung out of hot water and the surface sprinkled

with turpentine and applied over a painful region, is a common and an efficient rubefacient; it is of special benefit in colic, inflammation of the bowels and other abdominal troubles.

Mustard made into a paste with vinegar and spread on a piece of cloth of suitable size, constitutes an energetic irritant, suitable for the treatment of pleurisy and bronchial troubles. Following its use, the reddened surface should be sopped with a mixture of equal parts of turpentine and camphorated oil. Flour should be added to the mustard mixture in suitable quantities, before it is applied to children and others with a thin skin. With this class of patients, the action of turpentine, mustard, cantharides and some of the other irritant remedies upon the kidneys, should be carefully watched, as not infrequently strangury follows their use.

The old-fashioned spice poultice, if properly made, constitutes a mild and efficient plaster in the treatment of intestinal diseases, especially serviceable in young children. The mixture is composed of equal parts of powdered allspice, cloves, nutmeg, and cinnamon, and a sprinkling of black pepper. A sufficient amount of these ingredients may be combined to sprinkle freely over the surface of a flaxseed poultice, or in larger quantities, that the compound may be placed in a poke or bag of the required size dampened with vinegar and applied over the affected part. There are several other potent agents that might be mentioned in this connection, the action of which is especially beneficial under certain existing morbid conditions. Tincture of iodine is of this class, so is capsicum, ammonia, chloroform, ether, coal-oil and essential oil of mustard. The latter should be sparingly used and its effect upon the kidneys carefully watched.

The aged and very young do not withstand well the effect of the active rubefacient and vesicating agents, especially cantharides. Patients suffering from chronic kidney disease and those afflicted with paralysis, should not be subjected to the irritating effect of blistering agents, as serious consequences have frequently followed their use, especially in the latter affection where gangrene has been known to rapidly follow the blistering of a part.

SICK-ROOM DISINFECTION

To properly prepare a room or ward for the care of surgical cases and render it thoroughly free from active germ life after the removal from the premises of a septic or infectious case, the woodwork, including the floor, should be first thoroughly scrubbed with soap and hot water, followed with a mopping of the surface with a 1-500 bichloride or 1-40 carbolic acid solution. The room should then be subjected to the fumes of burning sulphur (2 pounds to every 1000 cubic feet), or formalin vapor from a bed-sheet, saturated with a forty per cent solution and suspended in the room for twenty-four hours, with the doors and windows tightly closed and the cracks pasted shut with strips of adhesive plaster or pasted paper.

To make the disinfection more thorough, the walls and ceiling should be washed with a strong bichloride or formalin solution. If the side walls have been previously papered, it should be removed, the walls sterilized and repapered if necessary. If the walls and ceiling are plain, they should be painted or calcimined.

Smallpox, diptheria, and scarlet fever have been contracted from sleeping in apartments many weeks after others had been down with the disease, after the house was supposed to have been thoroughly disinfected and ventilated.

The micro-organisms of erysipelas, carbuncle, and wound-diphtheria are exceedingly tenacious of life and will remain dormant for a long period of time, only to again spring into activity at the first favorable opportunity.

When operations are done in private homes, the bed or other rooms in which the patient is to remain during the convalescence, is prepared for the work as previously directed. When possible, a room should be selected having plenty of sun-light and ventilation, all furniture should be removed, except a stand or two, upon which instruments are placed, and the bed, curtains, carpet and pictures, should also be removed and the openings in and about the stationary wash stand securely sealed in with antiseptic material, to shut out offensive gases and odors. Some arrangement must be made to heat the room to the proper temperature for the time the operation is in progress, excluding coal oil

stoves or open gas plates for this purpose, as both render the atmosphere most disagreeable to the sense of smell. A wood or coal stove is to be preferred.

Trays, whether of glass or granite-ware, can be rendered safely sterile by first washing them in boiling water and then in a bichloride solution (1-500). All gauze, cotton and other material used for dressing, must be previously sterilized by dry heat or steam, and in the absence of ovens or sterilizers for thus preparing the necessary dressing, the material may be subjected to boiling water for thirty minutes or more.

Pus basins, urinals, slop-jars and other chamber utensils should be kept sterile by frequent washings in bichloride, carbolic, or formaldehyde solutions. Chambers and slop-jars may be kept free from odors of alvine discharges by the use of chloride of lime sprinkled in them after scalding them out with boiling water. Towels, napkins, sheets and pillow slips should be sterilized by boiling or subjected to dry heat after they are carefully laundered.

STERILITY

The physical incapacity to procreate the species, either on the part of the male or female, is known as sterility. Various causes may be cited for this abnormal condition, any one of which may alone prove effective against fecundation.

The causes leading up to the morbid state, in the male, are nonvirility, or absence of spermatozoa, resulting from chronic alcoholism, tubercular and syphilitic degeneration of the sexual organs, stricture, traumatism, and malformation. In the female, the cause is likely due to chronic metritis, leucorrhœa, tubal diseases, tumors, and aggravated forms of displacement. Gonorrheal salpingitis is perhaps the chief cause among women and arrested development of the ovaries, with imperfect ovulation contributes largely to the morbid condition.

The treatment will depend altogether on the cause of the sterile state. If the cause can be ascertained and removed, it will be the first and most important step in the line of relief. Inflammatory conditions, such as gonorrhœa, metritis, and endo

metritis, readily yield to injections and topical applications of potent antiseptic solutions. Tumors are to be removed and displacements corrected. Disease of the tubes may require their removal. No form of treatment will bring relief when the cause is due to undeveloped ovaries.

When the sterility is due to chronic alcoholism or other exhaustive habits, on the part of the male, these should be corrected at the outset. Rest and good nourishing food will contribute largely to a cure. Enfeebled states will often call for stimulants and tonics. In deformity of the sexual organs and when these are in most part absent, little or no hope for a cure can be entertained.

URINALYSIS

Before a patient is subjected to a surgical operation of great severity, the urine should be carefully examined for evidences of organic disturbances of the body, as by this course information of much value will be gained regarding the existing condition of the system and what the chances are for recovery, following the operative work.

At the outset, the surgeon should have a knowledge of what constitutes normal urine, that variations from the normal standard may be properly estimated, when determined by chemical and microscopical examination. One examination of a specimen of urine suspected of showing evidence of systemic invasion from diseased states, may be insufficient to determine the gravity of the organic lesion, hence, re-examinations should be made of specimens taken at various times to determine fully any depart· ure from the normal standard of the functions of the body.

Normal urine is usually pale yellow or light amber in color, and any departure from this standard denotes, in a measure, systemic disturbances from diseased conditions, or changes caused by the administration of certain medicinal agents. For example, urine containing a large quantity of uric acid will be dark amber in color, and decidedly yellow after taking rhubarb and santonin, also from passing large quantities of bile, especially noted in jaundice and lesions of the liver; carbolic acid and

balsamic remedies impart a dark and sometimes a smoky color, while tar, creasote, decomposed blood, and putridity of the urine will turn it very dark or almost black. A green color is produced by salicylic acid and indigo, also thymol; resorcin and methylene blue, impart a bluish color, and fuchsin, if taken for any length of time, will turn the urine a bright magenta color.

The normal quantity voided in twenty-four hours is about fifty fluid ounces, although diet and the extremes of temperature will cause the amount to vary.

The specific gravity of normal urine will vary between 1.015 and 1.025. If it ranges above 1.030, the examination will likely show the presence of sugar; low specific gravity indicates the presence of albumen. The specimen examined should be from urine passed on arising in the morning or from the amount voided during twenty-four hours. The specific gravity of urine is increased when the daily amount falls far below the normal standard, and decreased when the amount voided is much above fifty ounces.

Diet, medicine and disease markedly influence the reaction of urine. Normal urine is always slightly acid, although it may be slightly alkaline for a short period following a meal, where the diet is largely vegetable. Normally, acid urine will become neutral or decidedly alkaline if allowed to stand any length of time after its voidance. To determine whether or not urine is acid, use a blue litmus test-paper; acid urine will turn it red; if the urine is alkaline it will turn a red litmus test-paper a bluish shade. If the urine is neutral, the color of the test-papers will remain unchanged.

Urine may contain, as abnormal deposits, mucus, pus, blood, albumen, sugar, urea, bile and chlorides, that may be determined by chemical analysis, while the following list is best examined with the microscope; these are the urates, oxalates, phosphates, urate of ammonia, the triple phosphates, phosphate of calcium, uric acid, and cystine; also such organized deposits as bacteria, spermatozoa, tube-casts, vibriones, sarcinæ, torulæ, blood, pus and mucus.

To successfully examine the urine for the above named deposits, the physician will need a microscope, and an urinary

test case, containing several test-tubes, alcohol lamp, urinometer, ureameter, one or more watch glasses, two or more pipettes, a two ounce graduate, red and blue litmus paper, a small porcelain dish, two ounces each of nitric and acetic acid, a fresh supply of Fehling's test solution, silver nitrate, sodium hydrate, and three or four ounces of liquor potassium.

Urine that is more or less opaque, should be filtered before examining it for albumen or other deposits. Urine, to be examined, should be as fresh as possible, especially if its reaction be markedly alkaline. Albumen: To examine for albumen, a test-tube should be filled about one quarter full of urine; if the specimen is not decidedly acid, a drop or two of acetic acid should be added and then boiled over a spirit-lamp. If the urine becomes more or less flocculent or cloudy, a few drops of nitric acid should be added, if the flocculent matter remains the same, albumen is surely present.

The nitric acid test is made by adding a half drachm of the acid to two or three drachms of the urine in a test-tube, allowing the acid to slowly pass down the side of the tube while holding it at an angle of about forty degrees; the acid being the heavier, it will collect at the bottom of the test-tube, the urine remaining in one volume above it, and between the acid and urine, an opaque or distinctly white zone forms, which denotes the presence of albumen and does not clear up when it is gently boiled.

Another test for albumen that is very reliable is made by adding five grains each of citric and picric acid, dissolved in a drachm of water and added to about four drachms of urine in a test-tube; if albumen is present, a white precipitate will be thrown down. This test should not be used to examine urine for albumen from persons taking quinine, as a precipitate will result whether or not albumen is present. To detect albumen in urine that is strongly ammoniacal, requires a more delicate test. To four drachms of the suspected urine, add one drachm of sodium or potassium hydrate and boil in a test-tube over a spirit lamp and filter. To three or four drachms in a test-tube, add slowly a few drops of acetic acid, if albumen is present, a slight cloudiness will occur. The quantitative analysis of albuminous urine is made as follows: Fill an ordinary sized test-

tube one-half full of urine and add a few drops of acetic acid
and bring to a boil over a spirit lamp; the albumen, which will
be coagulated, will soon settle to the bottom of the tube, a drop
or two of pure nitrate acid added to the mixture will quickly
dissolve any phosphate that might be present in the solution.
The mixture is then set aside for five or six hours. The estimate
of the amount of albumen the urine contains, is made by com-
paring the bulk of albumen in the bottom of the tube with
the amount of urine used, whether it be a trace, one-eighth or
one-half.

Sugar: Let it be understood before examining a specimen of
urine for sugar, that albumen may be present in diabetic urine.
In cases where it is present in any quantity, the specimen to
be examined should be boiled and passed through filtering
paper.

Fehling's test is very reliable and exceedingly delicate. It
is made with a soda and a copper solution, the formulas for
which follow:

No. 1:

R.
   Copper Sulphate (Crystals) .... ℥ xiiiss
   Aqua. Dest. .... fl. ℥ xvij
M.

No. 2:

R.
   Rochelle Salts (Crystals) .... ℥ viiiss
   Sodium Hydrate Solution, spc. gr. 1.12 .... fl. ℥ xxxiv
M.

Both of the above mixtures are to be kept well corked, in a
cool place, as stock solutions.

To examine urine for sugar with Fehling's test, mix in a
test-tube one part of solution No. 1, with two parts of No. 2,
boil over a spirit lamp and add about one-fourth in volume of
urine as there is of the test solution; bring the mixture to the
boiling point; if sugar is present a yellow or brick colored pre-
cipitate of oxide of copper is soon thrown down. Where there
is only a mere trace of sugar in the urine, it will be necessary
to let the mixture stand for twenty-four hours before the small
amount of precipitate will show in the bottom of the test-tube.
Haine's test is made with the following solution:

℞.
 Copper Sulphate (Crystals) .... gr. xxx
 Aqua Dest. .... fl. ℥ ss
M.

When the copper is dissolved add:

 Pure Glycerine .... fl. ℥ ss

Thoroughly agitate and add:

 Liquor Potassium .... fl. ℥ v

Thoroughly mix by agitation, and filter; keep the mixture stored in a dark colored bottle.

In using, put about two drachms of the solution in a test-tube and boil over a spirit lamp, then add a few drops of the suspected urine and again bring to a boil. If sugar is present, a yellowish precipitate soon collects in the bottom of the tube.

Tromer's test is made by first freeing the suspected urine of albumen, if this is present, by boiling and filtering. To two drachms of the filtered urine in a test-tube, add an equal amount of sodium or potassium hydrate. To the mixture add eight to ten drops of a solution of sulphate of copper (gr. xx to water ℥ j.), heat the mixture to the boiling point; if sugar is present a yellowish red precipitate of the oxide of copper will soon show in the test-tube.

To determine the amount of sugar excreted in the urine the following test is very reliable: Put five ounces of the suspected urine in each of two six ounce bottles, in one bottle add a small teaspoonful of compressed yeast and close with a cork with a groove cut on two sides, to allow the escape of gas while fermentation is taking place. The other bottle should be tightly corked and both bottles set aside in a warm place for thirty-six hours, or until fermentation has ceased in the bottle to which yeast was added. The difference in the specific gravity of the two specimens will indicate the number of grains of sugar to each fluid ounce of urine.

Pus, if present in urine, is detected by the following test: Put two or three ounces of the suspected urine in a bottle or graduate, let it stand for a few hours, pour off the clear urine and to a few drachms of the cloudy portion remaining in the bottom of the receptacle add one-half the amount of a solution of sodium or potassium hydrate, (gr. xxx to water

℥j). A gelatinous mass results if pus is present. Further examination of the urine for pus can be made with the microscope. The above test for pus will also precipitate mucus when it is present in the urine in excess.

Urine containing pus and an excess of mucus is always alkaline, and contains albumen in varying quantities.

Blood may be determined in urine by placing three or four drachms of the suspected urine in a test-tube and adding to it one-half the amount of a solution of caustic potash (℥ ss to water ℥j). The mixture is brought nearly to the boiling point, when, if blood is present, the earthy phosphates that precipitate will be stained a blood-red; otherwise the sediment remains white.

If the urine to be examined is strongly alkaline, add a few drops of a solution of magnesium sulphate before adding the solution of caustic soda. Blood can also be determined by the aid of the microscope and spectroscope in most cases.

Another very delicate test for blood in urine is made as follows: Take one drachm each of freshly prepared tincture of guaiac and spirits of turpentine (the latter must have been exposed to the light and air for some weeks) and place the mixture in a large test-tube. Then add an equal amount of the suspected urine, letting it slowly pass down the side of the tube while it is held at an angle of about 45 degrees. The reagent being the lighter it will float upon the urine. A distinct indigo-blue ring will appear between the two fluids after standing a few moments, if the specimen examined contains blood; if none is present the stratum will assume a dirty, yellow color.

Phosphates are normal constituents of the urine. The calcium and magnesium phosphates being in excess in ammoniacal urine, are often mistaken for pus by those who seldom examine specimens of urine chemically or with the microscope. Urine containing phosphates in excess is always alkaline. They are precipitated by boiling in a test-tube over a spirit lamp and are cleared up or dissolved by adding a few drops of nitric acid.

Urates, with the exception of urate of ammonia, occur in acid urine. To test urine for an excess of urates, let a few

ounces stand in a beaker glass for a few hours; decant the clear liquid and gently heat two or three drachms of the residue in a test-tube; if the specimen clears up the sediment was urates. If a residue remains, collect it on a filtering paper and place it in a porcelain dish, adding to it a drop or two of nitric acid to dissolve it; the solution is then carefully evaporated to dryness on a water bath. Next add two or three drops of ammonium hydrate, when a beautiful purple-red color will immediately appear, indicating uric acid, or in lieu of this test allow the filtrate to cool; crystals of the urates will soon form.

Sulphates: If the sulphates are present in urine in excess, their presence may be determined by adding to three drachms of the suspected urine one drachm of a solution of barium chloride (gr. xxx to water $\mathfrak{z}$ j) and a half drachm of hydrochloric acid; a white precipitate follows.

Urea: This product of urine is always present in varying quantities. It is thought to be the product of the destruction of the nitrogenous tissues of the body, the accumulation of nitrogen being eliminated in this manner. The amount of urea excreted in twenty-four hours is about one ounce; certain articles of diet and diseased conditions will cause the amount to vary. To test for urea, put in a test-tube about three drachms of urine, to which add one drachm of pure nitric acid; if urea is present in excess, crystals will form at once upon the addition of the acid. If the amount of urea excreted is below normal, the deficiency may be determined by evaporating, on a water-bath, one ounce of urine to one-half this volume; after cooling add about one and a half drachms of pure nitric acid; if no crystals appear within a few minutes, the proportion of urea is below normal.

Bile: When this product of the urine is in excess it can be readily determined by adding about a drachm of urine to a half ounce of concentrated hydrochloride acid in a four ounce beaker-glass; to this mixture add half a drachm or more of pure nitric acid, which should be deposited on the bottom of the beaker-glass through a glass tube or funnel. A display of greenish colors at once takes place. The test is not reliable if the urine containing bile is undergoing decomposition. Bile may also be detected by placing a few drops of urine on a porcelain dish to which

a drop of pure nitric acid should be added; a display of colors takes place at once.

Indican: To detect this product when present in urine, add two drachms each of the suspected urine and nitro-hydrochloric acid in a large test-tube. To this mixture add slowly a drachm of a concentrated solution of chloride of lime (5 iv to water 5 j), a display of indigo-blue color takes place at once.

In estimating the amount of solids excreted in twenty-four hours, Haine's multiplies the last two figures of the sp. gr. by the number of ounces of urine voided in twenty-four hours, plus 10 per cent.

TRUSSES

Trusses are improvised instruments for retaining a viscus within its normal boundaries after it has been reduced. To accomplish this purpose effectually, the pad of the instrument should make firm pressure on the tissues over the rent through which the viscus has escaped and retain it in place when the body assumes any position circumstances require it to take. With a truss fashioned to suit the requirements of a reduceable hernia in young children, a cure may be reasonably expected if the instrument is kept properly adjusted over the abnormal opening through which the knuckle of the organ escapes. In most cases it will be well to adjust the truss before rising in the morning, removing it after retiring at night. A lighter truss may be worn at night and at other times when not taking violent exercise.

Trusses are made in various patterns, shapes, and sizes, to suit the various forms and degrees of hernia requiring their use. Femoral hernias are more difficult to retain as a rule than are inguinal ruptures, and fleshy persons wear a truss with less comfort and benefit than do persons of a thin habit of body.

When a truss is first worn it is apt to cause more or less discomfort, but should not cause pain, which it will do if improperly fitted. If the pad is too oval and the truss is strapped around the body too tight, the hernial opening is very apt to be made larger by the pressure.

Pads are made of hard rubber, cork or wood and covered with soft flannel or leather. They may be made of moderately thin rubber, oval in form and hollow and filled with water or air, making what is known as an air-cushion. These pads are fastened to steel braces that encircle the body and are covered with leather or vulcanite and are known as the elastic variety. The inelastic truss is composed of heavy webbing or leather and is generally adjusted to painful or irreduceable hernias more as a support than with any idea of effecting a cure.

McCormac formulated a rule for measuring the external pelvis for a proper fitting truss, which is done as follows: He establishes the point from which to measure at the lower part of the hernial opening in either femoral or inguinal rupture.
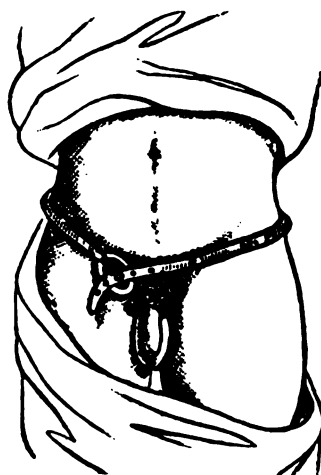
Fig. 24.—Truss adjusted to an inguinal hernia.

From this point he measures the distance to the anterior superior spine of the ilium on the same side, and from this point around the body about one inch below the crest of the ilium to the opposite anterior superior iliac spine, and then to the upper part of the hernial opening from which the measurement started.

A double hernia requires an elastic truss with a pad at either end, so adjusted that one pad may retain a femoral and the other an inguinal rupture, as represented in the cut. To

securely hold it in place two perineal straps will be required, fastened to the spring behind by looping around it and to studs in front.
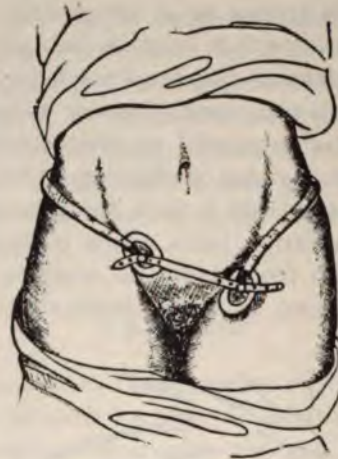
Fig. 25.—Truss adjusted to an inguinal and femoral hernia.

The pad of a truss fashioned to hold an umbilical hernia of moderate size should be a concave plate of suitable size and about three-eighths of an inch in thickness, made of metal or hard rubber and fastened to elastic webbing two inches or more in width. Pads with low narrow projections should not be worn, as they press into the hernial opening, gradually enlarging it, rendering the already abnormal conditions much worse.

The steel bands and pads will, of necessity, have to be specially constructed to meet the requirements of aggravated forms of rupture to hold them completely, under all conditions; otherwise the pillars of the ring may become irritated, leading to spasm of muscle and strangulation of the protruding part of the viscus.

To render the wearing of a truss endurable, it may be worn over the under shirt for the first few weeks and later next to the body with, perhaps, a piece of soft powdered gauze beneath the pad to prevent irritation of the integument.

Seeley's or DeGarmo's hard rubber truss is recommended in the treatment of hernia in young children, which should be worn night and day, except when necessary to bathe the child.

TRANSFUSION

To sustain life in persons nearly exsanguinated from the loss of blood and the ravages of disease, transfusion of blood from a healthy person, or the use of normal saline solution in suitable quantities is frequently resorted to.

The operation proves successful when properly executed in the large majority of cases, hence its technic should be understood and carefully followed. The fluid must be introduced at about the temperature of the body and in sufficient quantity to increase the patient's pulse, both in strength and volume and special care should be taken not to admit air into the blood vessel with the vital fluid.

If blood is to be interchanged, it may be passed directly from the healthy subject to the patient, or it can be drawn in a sterile vessel, whipped until the fibrin can be collected by straining, then injected.

Aveling's apparatus is preferred by most operators for direct transfusion of blood and is composed of a rubber bulb and two pieces of rubber tubing, eight or ten inches in length, extending either way from it. From each distal end of these rubber tubes is adjusted tapering metal tube-tips for entering the blood vessels, previous to the transferring of blood. Other instruments required in executing the operative work, are a scalpel, hemostats, scissors, needles, needleholder, dissecting forceps, and plenty of sterile dressings. The successive steps in the operative procedure are as follows: After the arms of the patient and donor are rendered aseptic, a rubber cord or some other constricting band should be applied to the arms of both, just above the point where the vessels are to be opened. The tissues overlying the distended vessel are incised and the edges of the wound carefully retracted, exposing the vein at the bottom. After hemorrhage has been controlled, the vein in each arm is carefully picked up with the dressing forceps and a V-shaped opening made in it with sharp cutting scissors, for the introduction of the tip of the transfusion tube. The tip of the transfusion syringe is taken from a sterile saline solution and placed in the gaping wound in the vein of the receiver, the tip at the opposite end of the syringe is introduced in the opening in

the vein of the donor. A hemostat is next clamped on the tube between the bulb and the person giving the blood, when the bulb, which has been previously filled with sterile salt water (1 drachm to the pint) to prevent the entrance of air, is compressed, forcing the salt water into the vein of the patient. The clamp is removed from the tubing on the donor's side and placed on the tubing on the patient's side, the bulb is then allowed to expand slowly at the same time filling with blood from the donor, when full, transfer the clamp back to the tube on the donor's side and compress the bulb as before; this process being repeated until the patient's pulse shows strength sufficient to discontinue the work. It must not be forgotten to remove the constricting medium from the arm of the receiver as soon as the valve-like opening is made and the tip of the apparatus is introduced. The apparatus should be placed in saline solution at a temperature of about a hundred degrees, where it remains until ready to adjust it in the veins of the patient and donor, care must be taken not to let air replace the solution with which the tubes are filled. The greatest care should be taken to have the apparatus thoroughly free from septic matter and of a temperature a little above that of the blood or saline solution to be transfused. Before opening the vein of the patient, a ligature should be placed under the vein a half inch or more each way from the point of opening, the one on the distal side should be tied at once, the one on the proximal side after the transfusion has been completed, to prevent a reflow of blood while the wound in the vein is being sutured with two or more fine catgut sutures. Both ligatures are then cut, the external wound closed with catgut, over which a small compress is placed and held in position with a bandage.

The mediate or indirect transfusion of blood is accomplished by first drawing a sufficient amount of blood from the donor by venesection. The sanguineous fluid is caught in a sterile porcelain vessel, which is placed at once in a water bath having a temperature of about one hundred and ten degrees. The fibrin is removed by whipping the blood with a sterile wisp of straw or wire, and the fluid strained through a piece of fine sterile linen. If the fluid has been kept at the right temperature (about 105 degrees) it is introduced into a vein in the patient's arm as

directed in direct or immediate transfusion. During the process the same care should be exercised to prevent air from entering the vein with the blood. The apparatus used for introducing the defibrinated blood is composed of a glass funnel, to which is attached a piece of sterile rubber tubing, two feet in length, in one end of which is fastened a tapering metal tip for entering the vein.

Normal saline solution may be injected into the veins instead of the defibrinated blood with quite as good results in most cases. The solution is prepared by adding one drachm of sodium chloride to a pint of sterile water and used at a temperature of one hundred degrees. Let a little of the solution run before placing the tip in the opening in the vein to avoid the introduction of air. The funnel should hold at least a pint, but there is seldom more than ten to twelve ounces introduced into the system at one time, except in extreme shock from loss of blood, in such cases a pint or more may be injected at an increased temperature of 110 to 115 degrees. The apparatus used for the transfusion should remain immersed in hot saline solution up to the time it is needed. The introduction of the fluid is hurried by the elevation of the funnel. The patient's condition should be watched while the transfusion is taking place, if restlessness and pain is complained of, the funnel should be lowered, lessening the force of the current.

Subcutaneous injection (infusion) of saline solution is often resorted to for the relief of extreme shock from the loss of blood with the result that relief is quickly brought about.

The apparatus utilized for this purpose is a glass funnel, holding a pint or more of fluid, with which is connected a single or a bifurcated rubber tube, in the distal ends of which small trocar tips are fastened, which are forced through the skin and on into cellular spaces, such as are found under the breast and in the groins. Infusion in these regions is so free from bad after-results and is so easily and quickly given that the method should be frequently resorted to in cases of approaching collapse from hemorrhagic losses.

To insure freedom from infection, the apparatus, especially the needle, should be thoroughly sterilized and the parts injected carefully prepared. To avoid giving pain in introducing

the needle, a hypodermic of cocain may be previously given, following with a small puncture of the skin with the point of a sharp bistoury. At the completion of the infusion, a small piece of zinc oxide plaster should be placed over the puncture to prevent infection and a reflow of the injected fluid.

When given for the purpose mentioned, prompt relief is usually noted. The great thirst that usually follows the loss of blood is relieved, and the patient otherwise made comfortable. The amount of saline solution used in this manner will vary with the demand. A quart or more can be given in grave cases of collapse. Rectal injection of hot saline solution is frequently resorted to, to overcome shock from the loss of blood. A quart or more of the fluid may be used at one time. The injection should be given slowly and high in the bowel through a large catheter or rectal tube. If the first portion given is soon evacuated, the operation should be repeated as before. A glass funnel with connecting rubber tube and large catheter will complete the necessary apparatus.

TABLES OF EQUIVALENT WEIGHTS AND MEASURES

Drachms	Grams or Cubic Centimeters	Troy Weight
1 =	4	GRAINS
2 =	8	24 = 1 pwt.
4 =	16	480 = 20 pwt. = 1 oz.
6 =	24	5760 = 240 pwt. = 12 oz. = 1 ℔.

Avoirdupois Weight

DRACHMS	OUNCES				
16 =	1 =	437.5 grains Troy			
256 =	16 =	1 ℔. =	1.2153 ℔s. Troy		
6,400 =	400 =	25 ℔s. =	1 quarter		
25,600 =	1,600 =	100 ℔s. =	4 quarters =	1 cwt.	
512,000 =	32,000 =	2000 ℔s. =	80 quarters =	20 cwt. =	1 ton

Troy	Cubic	Apothecary's Weight	
FLUID OUNCES	CENTIMETERS	60 minims	= 1 fluid drachm
1 =	32	8 fluid drachms	= 1 fluid ounce
2 =	64	16 fluid ounces	= 1 pint
4 =	128	2 pints	= 1 quart
6 =	192	4 quarts	= 1 gallon
8 =	256	45 drops of water	= 1 fluid drachm
12 =	383	2 tablespoonfuls	= 1 ounce
16 =	512	4 fluid ounces	= 1 teacupful

Apothecary's Weight—Continued

437½ grains = 1 ℥ (*Avoir.*)		= 28.3 grams
480 grains = 1 ℥ (*Troy* or *Apoth.*)		= 32 grams
Kilo (K) = 1000 grams		= 2.2 ℔s.
Liter (L) = 1000 C. C.		= 0.976 qt.
Meter (M) = 1000 M. M.		= 39.37 inches
100 C. M.		= 40 inches
5 C. M.		= 2 inches
2.5 C. M.		= 1 inch

Apothecary's GRAINS or MINIMS		*Metric* GRAMS or CUBIC CENTIMETERS		Expressed in Fractions
$\frac{1}{64}$	=	0.001	=	$\frac{1}{1000}$
$\frac{1}{32}$	=	0.002	=	$\frac{2}{1000}$
$\frac{1}{16}$	=	0.004	=	$\frac{4}{1000}$
$\frac{1}{12}$	=	0.005	=	$\frac{5}{1000}$
$\frac{1}{8}$	=	0.008	=	$\frac{8}{1000}$
$\frac{1}{6}$	=	0.011	=	$\frac{11}{1000}$
$\frac{1}{4}$	=	0.016	=	$\frac{1}{60}$
$\frac{1}{3}$	=	0.022	=	$\frac{11}{500}$
$\frac{1}{2}$	=	0.033	=	$\frac{1}{30}$
$\frac{2}{3}$	=	0.044	=	$\frac{11}{250}$
1	=	0.066	=	$\frac{2}{15}$
2	=	0.133	=	$\frac{9}{15}$
5	=	0.333	=	$\frac{1}{3}$
10	=	0.666	=	$\frac{2}{3}$
15	=	1.000	=	1
20	=	1.333	=	1⅓
30	=	2.000	=	2

By memorizing the approximate equivalents writing prescriptions, using the terms of grams, will prove a comparatively easy matter, as the following examples will show. By referring to the appended table it will be seen that

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1 grain   = .066 gm.
1 drachm =    4 gm.
1 ounce   =   32 gm.
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Prescription examples:

℞.
  Boric Acid .... ℥ ij .... 8 ⎫
  Salicylic Acid .... gr. xx .... 1 ⎬ 20+
  Starch .... ℥ j .... 32 ⎭
M.

Dusting powder.

℞.
  Carbolic Acid .... ℥ ij .... 8 ⎫
  Tannic Acid .... ℥ j .... 4 ⎪
  Alcohol .... ℥ iv .... 16 ⎬
  Glycerin .... ℥ ij .... 64 ⎭
M.

Used hypodermically to inject pile tumors.

SOME PRACTICAL POINTS IN
NURSING THE SICK

The skillful and painstaking nurse who has good judgment and knows when and how to exercise it in caring for the sick and injured, fills an important position in the field of the practice of medicine and surgery. In disposition, a nurse should be kind, attentive, and sympathetic to a marked degree, being ever alert to the wants of the patient, and ready to extend any little courtesy that will in any way contribute to his or her welfare.

A noticeable feature of a well trained nurse, is her tidy toilet; her garments should be white and scrupulously clean, likewise the body, head, hands and nails. Keep the patient clean, as well as the bedding. Never allow soiled articles of whatever nature, to remain in the sick room. See that the patient's surroundings are pleasant and quiet, and never give countenance to gossip. Never prescribe medicinal agents for the sick, except in emergency cases, but faithfully carry out to the minutest detail the instructions of the attending physician: and report to him at the earliest opportunity any features of the case that might appear to you out of the ordinary course of events.

Always be cheerful in the presence of the sick, it matters not how grave the case may be, never wear a troubled look when administering to their wants. Do not be too lavish in your encouragement to a convalescing patient and promise a speedy recovery, as often morbid states take on a serious turn for the worse, requiring a long period of time for the restoration to health. In all cases see that the room or ward is properly ventilated, and protect the patient from direct drafts.

Much care and judgment will have to be exercised in the preparation of food for the sick and injured, as owing to a capricious appetite, the most nourishing and palatable of viands are often spleened against.

It is never advisable to consult the patient with regard to what he wants to eat, his immediate physical state should dictate to the nurse what he requires in the way of foods; prepare and serve it daintily, and in this way pleasantly surprise him.

Following a laparotomy operation, the patient is enjoined to keep as quiet as possible for the first few days, and she should be placed in a room properly shaded, but cheerful. Carefully note the variations of the temperature and pulse; remembering that a rising temperature usually signifies infection of the wound or the peritoneum, while a sudden rise of the temperature preceded by a chill, indicates suppuration, and that the pulse usually is quickened, twenty to thirty beats for three or four days, following any severe operation; this is due to the disturbance to the nervous system and need not excite over anxiety on the part of those in attendance. Post-operative conditions without pain, frequently induce a falling pulse which is usually considered a favorable sign, while a rapidly rising pulse approaching one hundred and forty to one hundred and fifty, indicates great danger and the cause should be immediately ascertained, and removed if possible. A very grave condition of body is indicated by a rising pulse and falling temperature. A favorable sign of progress is a relative rise and fall of the pulse and temperature in all cases.

Any post-operative case with a persistent pulse of one hundred and sixty, extending over eight to ten hours, is likely to terminate fatally.

It may not be amiss to suggest in this connection, that the morbid state presenting a rapidly increasing temperature and pulse, be relieved with effective doses of some one of the saline laxatives, preferably the sulph. of magnesia.

Flatulence is a most distressing symptom in the after-treatment of abdominal surgery. It is a feature to be reckoned with in nearly all cases, slight in some, but painfully severe in grave post-operative states. Discomfort from its accumulation is usually manifested in twenty-four to thirty-six hours, following the operative work. Every effort should be made to relieve the morbid state, as it may provoke conditions so distressing, that it of itself, may prove fatal; the only relief lies in opening the bowels with epsom or rochelle salts, which should be given in broken doses, or by high rectal injections. Not much benefit is derived from the administration of drugs, other than potions of hot peppermint tea, and high rectal enemas of one teaspoonfull of turpentine, two ounces of glycerine, to one pint of quite warm water, to be repeated three times a day if required.

The inhalation of cider vinegar, following immediately after the anæsthetic will prevent, or at least relieve nausea and vomiting, resulting from the inhalation of ether or chloroform; later if the nausea is persistent, apply a towel wrung out of cold water and vinegar, equal parts, around the neck, or add thirty drops of glonoin, to four ounces of peppermint water and give teaspoonful doses every hour or two, this mixture is especially beneficial in depressed states, with poor heart action. One-half grain of muriate of cocaine added to three ounces of cherry-laurel water, makes an efficient mixture to control nausea, it should be given in twenty drop doses, pure or added to a half teaspoon of water. Rectal enemata of one-half ounce of pure glycerine is also valuable to control nausea; it should be repeated every two hours if needed; its beneficial effect is produced by establishing peristalsis. Should there be great thirst attending the nauseated state, give rectal enemata of the saline solution; a teaspoonful of salt to a pint of water, of which four ounces should constitute a dose, repeated every two or three hours, as may be needed. The administration of medicinal agents by enemata is preferred, as thereby the bowels are freed from fecal matter and the passing of flatus aided. If the distention of the

bowel is great, and the nausea seems to be a resulting feature, give one-sixtieth of a grain of nitrate of strychnia, hypodermically, every two hours for three doses.

For the first few days following abdominal operations, the nurse must be watchful for symptoms of internal hemorrhage, prominent symptoms of which restlessness, pale, pinched features, a rapid, weak, and irregular pulse, with a cold, clammy skin and extremities usually present. In grave cases the pupil is dilated, the patient complains of impaired sight, as well as hearing, which is attended with a roaring in the ears. The morbid state is usually attended with a sub-normal temperature, and increased respirations. As the grave condition is to be relieved by the surgeon, the first suspicious symptoms observed should be at once reported to him.

Shock, which is a marked depression of the nervous system, demands special attention at the hands of the nurse. Many of the marked symptoms of shock are not unlike those of hemorrhage, from which the depressed state must be differentiated. Indications of shock usually follow immediately severe operative work, while symptoms of hemorrhage become manifest several hours after the operation.

As soon as the first symptoms of shock present, give rectal enemata of three or four ounces of strong coffee, to which may be added a drachm or two of rye whiskey, or brandy, in grave cases. The dose may be repeated in two hours. Keep the patient in the recumbent position, with the head low, and through the medium of hot water bottles placed around the patient, maintain the temperature of the body. Friction, and hot compresses to the cardiac region, will prove of service in some cases; as will hypodermic injections of twenty drops or more of sulph. ether, every fifteen to thirty minutes, for three or four doses, when small doses of brandy and aromatic spirits of ammonia may be substituted. The most effective stimulant in the depressed state is the nitrate or sulphate of strychnia in one-thirtieth or one-sixtieth of a grain, hypodermically administered, and repeated every hour or two, as the nature of the case will demand. When reaction sets in, give in small quantities and at frequent intervals the most nourishing of fluid foods, hot milk, beef tea, clam bouillion, and chicken broth are dishes along

this line. If these articles of diet are well borne, substitute the following fluid mixture for the milk and bouillon; whip to a thin fluid, the whites of one or two eggs, and add it to a teacupful of equal parts of boiling milk and coffee, stirring well to prevent the egg-albumen from becoming stringy, this makes one of the most nourishing and stimulating fluid foods possible to prepare.

Thirst is another feature of abdominal surgery that sometimes taxes the nurse's patience and skill to relieve. Teaspoonful doses of hot water, plain or with a little lemon juice added, repeated every few minutes, is the usual prescription for its relief; it is allsufficient in many cases. Clove tea, made by adding a teaspoonful of whole cloves to a teacupful of boiling water, letting the mixture stand till cool and give in half teaspoonful doses. Or let the patient have small pieces of ice to dissolve in the mouth; it is taken with a relish, but it has been known to increase the thirst instead of relieving it. Enemata of salt water are commended here, as well as holding in the hands, cloth that have been wrung out of cold water.

The safest and most comfortable position for the patient to assume for the first few hours following laparotomy operations, is upon the back, with the knees flex and resting on a hair or air cushion. This position relieves tension of the abdominal muscles and equalizes the pressure of the pelvic organs. There is no reason why the patient should not be allowed to rest for a short time on either side a few hours following the operation, except in very grave cases; the changing of position in bed every few hours, later on, will prevent pressure on prominent parts which very often eventuates in bedsores. If indications of abrasion of the skin should present, bathe the inflamed and tender parts with equal parts of hamamelis and camphor-water, or the same proportions of alcohol and water. Glycerole of tannin may be applied two or three times a day to harden the integument. If the morbid state goes on to ulceration, wash the sore part with the alkaline solution twice a day, wipe dry with pledgets of absorbent cotton, and dust on the ulcer oxide of zinc, and protect the part with cotton pads. Mixtures having a greasy base, usually find no place in the treatment of these inflamed ulcers; however much benefit has been derived from a

compound composed of balsam of peru, one part, and camphorated oil, five parts, applied three times a day, last at bed time.

To facilitate the giving of an enema, have the patient lie on the left side, when it is possible to do so, although it may be more convenient in many cases, to give it while the patient is lying on the back, especially if only a small quantity of fluid is administered. Remedies to relieve pelvic pain, and to unload the rectum and colon, are frequently given in this way, as well as fluid food in weak and exhausted conditions of the system, when for any reason the stomach will not retain it.

Usually the last act of the surgeon in the operating room after the dressings are applied, is to catheterize the patient. The nurse should repeat the operation every six to eight hours, should the patient be unable to void the urine naturally; irritable states of the bladder may require the urine to be drawn even oftener than that. Some prefer a soft rubber catheter, but a glass instrument is best, as it causes less irritation in introducing and is easily kept sterilized. Every patient should have a separate, sterilized catheter, and to keep it cleanly, it should be immersed in a five per cent solution of borax water, or a solution of the same strength of carbolated water after using. Before introducing the catheter, cleanse the meatus and adjacent parts with pledgets of absorbent cotton, wet in a weak solution of bi-chloride, or other antiseptic mixture. Without due observance of these precautions, an irritable state of the urethra and bladder is likely to ensue.

It is very necessary that the nurse pay due attention to the condition of her teeth, having decayed and loose ones removed, and the others kept well brushed with some efficient antiseptic solution, that the breath may be always sweet and inoffensive.

Always arrange to have cleanly sterilized garments for the anæsthetizer to put on before commencing any operative work, it being as necessary for him to observe these antiseptic precautions as for the operator or nurse.

If painful states demand an anodyne for relief, give one-half grain of sulph. of codeine, hypodermically, in the upper part of the thigh, every six to eight hours; or prescribe a suppository made as follows:

℞.
  Codeine .... gr. x
  Ext. of Hyoscyami ....
  Ext. of Canabis Indica, āā .... gr. ij
  Cocoa Butter, q. s. to make Suppositories No. 12.
M. Sig.—Use one as may be required to relieve pain.

If for any reason nourishment cannot be taken into the stomach, the following fluid articles of diet may be given per rectum: four to six ounces of peptonized milk, to which one or two eggs well beaten up may be added, as well as a half ounce of whiskey, in vitally depressed states; quite warm milk, to which is added a little salt; beef tea, beef juice with a few drops of hydrochloric acid added; rice gruel, made with milk and water, to which may be added a few grains of bicarbonate of soda, or pepsin; or the whites of two or three eggs, well beaten and mixed with six ounces of milk and lime water. If the anus becomes sore, add fifteen to twenty drops of the deodorized tincture of opium to each potion administered.

Light nourishing fluid diet that may be allowed as soon as the stomach will receive and digest it, may be prepared along the following lines: hot or cold tea; white of one egg added to a teacupful of equal parts of boiling milk and coffee; hot peptonized milk; two tablespoonfuls of lime-water, added to a glass of hot or cold milk; the whites of two eggs beaten up and stirred into a glassful of water, to which may be added a few drops of lemon juice, or add the lemon juice and whites of two eggs to cracked ice and give in teaspoonful quantities; a little sugar can be added, which will make the mixture very palatable. Chicken broth and beef tea or juice is often taken with a relish, and is very nourishing; so is the broth of oysters, clams and mutton. After the first week, the diet may be composed of more substantial food; let them eat sparingly at first of boiled or poached eggs with toast, beef soup, milk toast, graham bread and butter, jellies, custards, and milk punch, scraped beef sandwiches, stewed chicken and broiled fish. Tea and coffee are allowable if they do not cause the patient to be wakeful or nervous. The patient should be allowed plenty of pure, fresh water to drink; seltzer and lithia water are usually perferred.

PART TWO

Acute Infectious Diseases

ERYSIPELAS

Erysipelas is a term applied to an acute infectious inflammation caused by the inoculation of streptococci. It is a true superficial cellulitis. The little blebs that frequently form over the area of infection contain serum. Pus does not form as a result of true erysipelatous inflammation; however, the serum may appear cloudy, the result of a mixed infection. The onset of the disease is attended with rigors followed by fever and restlessness. The local point of infection is red, hot, swollen, and usually very painful. When the disease appears without any visible cause, it is spoken of as idiopathic, but when it follows an injury it is mentioned as traumatic.

The general symptoms are rigors, headache, and fever, the temperature frequently rising to 103° or 108°, attended with nausea and vomiting. The course of the disease is usually ten days to two weeks, and as a rule tends to recovery.

Treatment consists in keeping the bowels free with saline laxatives and with frequent sponging of the body with weak solutions of biborate of soda to control feverish conditions, aided by giving teaspoonful doses of the following mixture:

℞.
    Spc. Tr. Aconite .... gtt. x
    Spc. Tr. Veratrum .... gtt. xv
    Spc. Tr. Rhus Tox .... gtt. x
    Peppermint Water, q. s. ....fl. ℥ iv
M.   Sig.—Taken as above directed.

℞.
    Mur. Tr. Iron .... ℨ ii
    Glycerine ....
    Simple Syrup, āā q. s .... ℥ ij
M. Sig.—A teaspoonful every three hours, taken in a half
    wine glassful of water.

In cases that go on to suppuration, developing a septicemic state, the following will be indicated:

℞.
      Spc. Tr. Echafolta .... ℥ iii
      Spc. Tr. Phytolacca .... ℥ i
      Peppermint Water, q. s. ....fl. ℥ iv
      M. Sig.—A teaspoonful every two hours.

As a local application use the following mixture, first enveloping the part in absorbent cotton, keeping it wet with the solution.

℞.
      Spc. Tr. Phytolacca ....
      Spc. Tr. Echafolta, āā .... ℥ j
      Glycerine .... ℥ ij
      Aqua ....fl. qt. j
      M.

Or in cases attended with severe burning pain, no agent seems to give greater relief than does the biborate of soda solution, one ounce to two quarts of water to which add one or two drachms of glycerine, apply it the same as advised with the other solution.

It is advisable to shield the affected part from the atmosphere, hence keep it wrapped with cotton or bandaged loosely, the same kept wet with the antiseptics until the inflammation has well subsided. Painting the inflamed area with iodine or the tincture of the muriate of iron is seldom resorted to, however, the latter is efficient in those cases that show deep redness, and then it should be limited to the margins of the inflamed area. Should an abscess form, it should be incised and treated as advised in the treatment of suppurative inflammation.

After the subsidence of the acute symptoms, stimulating remedies are usually indicated, the most valued of which are quinia, strychnia, and iron, given singly or in combination.

The diet at the outset of the disease should not be over-stimulating; rice, iced milk, ice-cream, custards, and meat jellies, are usually taken with a relish, while rich lemonade, iced tea or milk are admissible as beverages.

Should the morbid state be complicated by a depressing diarrhœa, two or three drop doses of McMunn's elixir of opium taken in camphor or peppermint water every two or three hours will be demanded; should this be found inefficient, give teaspoonful doses of an infusion of Ext. of logwood, made by

steeping one drachm of the extract in one pint of water, every hour or two.

If from loss of rest and sleep, the patient becomes weak, depressed, and worn out, hypnotics will be indicated, the most valued of which is chloral, given in five grain doses every two or three hours until sleep is produced.

An efficient formula for sleepless states is the following:

R.
    Muriate of Heroin .... gr. ij ·
    Chloral Hydrate .... ℥ j
    Peppermint Water ....fl. ℥ ij
  M. Sig.—A teaspoonful every four or five hours, or as need-
    ed.

Wounds attacked with erysipelas require to be frequently dressed with strong antiseptic washes, the alkaline solution being preferred to others on account of its effectiveness, non-toxic qualities, and its cheapness.

GLANDERS—FARCY—EQUINA

Glanders is one of the infectious diseases, incident to the lower animals, but transmissible to mankind. Horses seem to be principally subject to the disease, while cattle are thought to be immune.

The disease is characterized by high fever, of a typhoid nature, debility, marked catarrhal conditions of the respiratory mucous membranes, soreness of muscular tissue, with tenderness and painful states of the joints, numerous small nodules appearing on the skin and in the subcutaneous tissue, that in a short period of time break down into a suppurating sore. The lymphatic glands in the cervical region become infected, as do those of the chest and axillary regions, rendering them tender and swollen. The discharge from the nose is at first thin and sanious, which in a few days changes to purulent and very offensive matter.

The specific micro-organism usually finds its way into the body through the medium of the mucous membrane or traumatic abrasions on the surface of the skin.

The prognosis should be guarded, as death frequently re-

sults from pyæmia or septicemia, the acute phases of the disease. Should life be tided over the acute stage, there will be some hope of recovery by adhering to a vigorous stimulating and supporting regimen.

The early phases of the disease are to be assailed with antiseptic washes and mixtures; the most potent of these are the alkaline antiseptic solution in various strengths, and glycothymoline reduced to suit the case in hand. The ulcerated lesion should be curetted, cleansed, and cauterized. Support the vital forces with stimulants and tonics, and provide a dietary of rich and nourishing food. Prevent the spreading of the disease by isolating those suffering from the morbid state.

ANTHRAX—MALIGNANT PUSTULE

Anthrax is an acute infectious disease with pronounced local manifestations, resulting from the presence in the system of the **bacillus anthracis**. The most severe form of the disease is observed among goats, sheep and cattle, where it frequently occurs and is readily communicated to individuals coming in contact with them.

The anthrax bacillus, once it enters the system, soon finds its way to the skin surface, where it manifests its presence by the formation of a little papule, which changes to a vesicle within two or three days, around which, for a half inch or so, the integument appears red and soon becomes indurated and somewhat elevated above the surface of the skin.

The upper extremities, the face and neck, are locations where the pustule usually appears after infection, followed in a few days by more or less fever and general physical weakness. In rapidly fatal cases the temperature becomes subnormal and other constitutional symptoms soon supervene, indicating rapid dissolution.

Individuals engaged in handling meats, hides, hair, and wool are especially liable to the disease, which may be contracted through the skin or by the germ finding lodgment within the intestinal mucous membrane or respiratory organs. As an evidence of the infectious character of the disease, it is not

uncommon for the lymphatic glands, located near the local papule, to rapidly enlarge and become very sensitive to the touch, but there is little pain, if any, accompanying the morbid state.

Treatment: It is well known to bacteriologists, surgeons, and other investigators in the field of surgical work, that the anthrax bacilli and their spores are the most difficult to destroy of any of the infectious germs. They will resist the effect of ordinary antiseptic solutions, even boiling water for some minutes. The one antiseptic most reliable to destroy the spores is a one per cent boiling solution of carbonate of soda, which will destroy every form of the germ inside of three minutes.

The most fatal form of the disease is that occurring in the intestinal canal and respiratory tract. Following the inception of the disease, there are rigors, fever, digestive disturbances, pain in the chest, cough, respiratory changes, excessive thirst, muscular soreness and pronounced physical weakness.

The treatment of anthrax should comprise both local and general measures. To antidote the poison, such remedies as are indicated in the individual case should be pushed to the limit. If the tongue is red, dry, with a tendency to crack at the edges, hydrochloric acid dilute is indicated and should be taken every three hours during the day. If on the other hand, the tongue is red and dirty, with an increased amount of saliva, sulphurous acid should be substituted for the muriatic. Salicylic acid in five grain doses every three hours will prove an excellent internal antiseptic remedy, when the tongue is broad, coated with an ashen colored fur, fetid breath, accompanied with a sweetish taste. Salol is also beneficial in such cases and can be given in five grain doses in tablet form every three or four hours during the day; this remedy proves of the greatest value in cases of intestinal infection, accompanied with a troublesome diarrhœa.

The strength must be maintained by the administration of peptics and tonics, the most active of which are arsenic, phosphorus, strychnia, and the lime salts, taken in small but frequent doses.

The bowels should be kept open with the saline laxatives

and the function of the kidneys kept active with the acetate or citrate of potash.

The local pustule should be opened up thoroughly and the surrounding area also, if infiltrated, following which, the infected wound should be cauterized with pure carbolic acid and immediately sopped with alcohol. The after dressing should be composed of boric acid or a two per cent solution of permanganate of potash and changed as often as the conditions require. The patient should be kept at rest in bed from the first, upon a nourishing and stimulating diet; eggs, beef-tea, meat broths, ice-cream, champagne wine, malted milk and juices of fruit, should compose the dietary.

TETANUS

Tetanus or lockjaw is a septic-infectious disease, specific in character, due to the presence in the blood of bacillus tetani. The affection frequently results from punctured wounds, and others that become septic; under these conditions we speak of the morbid state as traumatic, when the spasmodic condition is ushered in without any visible or apparent cause, it is idiopathic in character. The spasms are not general in character; they affect only certain groups of the voluntary muscles.

The tetanic state may be preceded by rigors, pyrexia, and restlessness. It is frequently ushered in without any premonitory symptoms.

The early symptoms of the affection are, stiffness of the muscles of the neck and jaws, following which the muscles of mastication become tonically contracted, and alternately relieved by clonic exacerbations. If the morbid state is traumatic in character, there will be a sanious discharge from the wound, which may be foul smelling, with increased pain in the part. All of the voluntary muscles, especially those of respiration, may now become involved.

It may be remarked here that the spasm of muscles appearing in the neck and jaws at the outset, is considered diagnostic, and excludes the affection from being the early symptons of

hydrophobia or strychnia poisoning, these symptoms being absent in the latter affections.

About this time tonic spasms of the muscles of the neck, back and abdomen follow in rapid succession with increased pain; there is a jerky, irregular action of the muscles of respiration, and the wall of the abdomen is tense and rigid. Should the muscles of the back be chiefly affected, there will be an arching of the body backwards, opisthotonos; emprosthotonos represents the body being bent forward by the tonic contraction of the anterior body muscles.

When the facial muscles are attacked, the face presents a grinning appearance, giving rise to the expression called, risus sardonicus. Another feature of the disease is that the upper extremities are exempt from attacks, while the lower may become rigid with spasmodic action. As before remarked, there are intervals of relaxation, but not to the extent noted in strychnine poisoning. There may be a rise of temperature of several degrees, but the mind usually remains clear. In fatal cases, the spasmodic attacks follow each other in rapid succession, the patient finally dying from sheer exhaustion within three or four days; should they survive this period, a more hopeful view may be taken of an ultimate recovery.

The treatment consists in applying antiseptics to the wound, should the tetanic state result from traumatism; to do this the wound may have to be opened up, that it may be assailed with the potent fluids. The alkaline mixture is preferred here to any other, fairly immersing the part in it, when it is possible to do so; however, a five per cent solution of permanganate of potash, or 1 to 3000 bichloride wash will be found effectual.

Internally, the spasmodic state will demand twenty to thirty drop doses of gelsemium every half to one hour till the symptoms are under control; to aid the effect of this remedy, an occasional thirty grain dose of bromide of soda is useful. If for any reason these remedies cannot be retained by the stomach, administer them, or others that may be indicated, per rectum. Should the agents named fail to relieve the morbid state within twenty-four hours, resort should be had to the quieting effect of chloral hydrate, in thirty to forty grain doses, given in syrup and water, or one-fourth grain of morphia, given endermically,

every two or three hours, or as may be needed to promote rest and hold the spasmodic action in check. In bad cases, chloroform, by inhalation, may have to be resorted to at times to subdue the aggravated symptoms. At the outset, the bowels must be moved by enemas of equal parts of glycerine and water, to which add twenty to thirty drops of turpentine.

The greatest quiet must be required, and the room kept dark, and well ventilated. If nourishment cannot be taken by mouth, feed the patient per rectum.

HYDROPHOBIA—RABIES

Hydrophobia is a specific disease, having a septic-infective origin and is characterized by a convulsive state of various groups of muscles. The morbid state is presumed to be the result of systemic infection from a specific microbe inoculation, although all efforts to discover the germ have failed of success, and to the best of our present understanding, the disease results from inoculation of a specific virus from an animal infected with hydrophobia. As the virus is found principally in the saliva of dogs and cats, and other animals of their kind, it is reasonable to contend that originally the morbid state came from a bite, although it is well known that the fluids of the system of such beasts contain the virus outside of the saliva.

Persons suffering from an attack of the dread disease manifest certain symptoms that are characteristic of this affection alone; the common symptoms at the outset of the morbid state are malaise, headache, fever, and sometimes nausea and vomiting. Later along in the course of the disease these conditions give way to pain in or near the bitten or infected part, with paralytic weakness of the same, which often spreads to adjacent organs and limbs, frequently producing a general state of paralysis, causing great difficulty in swallowing food and liquids. The spasmodic state of the muscular system is so acute in many cases that a sudden noise or directing a sudden draft of air upon the patient as by fanning him, will excite a nervous paroxysm, distressing in its effect. Often the irritation about the fauces is so acute that fluids cannot be swallowed, especially

water, except in teaspoonful doses, and even an attempt to do so will often violently excite to spasms the muscles governing the respiratory act, which is accompanied by a hoarse, loud cough simulating the barking of a dog.

Symptoms of hydrophobia do not become manifest until about six weeks after inoculation, during which time the traumatism from which the infection occurred has healed. This time in which the poison lies in a dormant state is called the period of incubation. This may extend over several months, and from all appearances the patient is in the best of health. As before remarked, the early symptoms are those of languor, headache, sleeplessness, and great anxiety. Following this train of symptoms, spasmodic paroxysms of the muscles of deglutition frequently .occur, quickly followed by spasmodic action of the laryngeal muscles. About this time an abundant secretion of saliva is noted, which proves a source of great irritation on account of the inability to swallow it, and it constantly runs from the mouth in ropy streams. General convulsions supervene at about this time, which last about half an hour, usually attended with marked mental excitement, and often delirium. There are intervals of complete relaxation between the attacks. There is usually an increase of temperature amounting to two or three degrees, and the pulse is correspondingly increased, irregular and sharp. This aggravated state may continue for a week or ten days, but the patient often succumbs in less time from general paralysis or sheer exhaustion.

Treatment: In suggesting a treatment for this grave disease, it may be said that little can be done in pronounced cases to even alleviate the distressing symptoms of the morbid state. Fully eighty per cent die if no effort is made in a medicinal way to control the ravages of the disease. This death rate can be reduced fifty per cent by the timely use of caustics to the infected wound, or the graded immunized emulsion of the dried spinal cords of rabbits infected with rabies injected in the hypochondrium, and repeated every eight or ten hours, according to the severity of the case, during the first forty-eight hours; then once a day for the next six days, each succeeding day's dose being a weaker emulsion.

There are two very reliable methods of procedure in the treatment of wounds inflicted by an animal infected with rabies. One is to incise the wound as soon as possible after it has been inflicted, and the other is to inject hypodermically in and around the wound a two per cent solution of permanganate of potash. Should the wound be deep, the injection should be correspondingly deep, as in this way it is possible to antedote or neutralize the virus before it enters the circulation. It is not necessary to repeat the potassium injection but once; for this reason some care should be exercised in depositing the solution, that the infected area be well saturated with it.

Antispasmodics, chloral, morphia, heroin hypodermically administered, and chloroform by inhalation, will, for a time, hold the distressing symptoms in subjection; but this will accomplish little good, however, unless it is by staying the ravages of the disease until the vital powers can eliminate the poison.

In aggravated cases, where it is impossible for the patient to swallow even fluid food to sustain the recuperative powers of the body, feeding may be carried on through a stomach tube or by rectal alimentation.

Owing to the grave nature of the disease, the prognosis is very unfavorable.

GANGRENE

Gangrene means death to a part, and mortification signifies the same thing. The morbid condition may be due to traumatism or disease, the disorganization of tissue being more rapid from the former cause than from the latter.

In **traumatic** gangrene the death to tissue is due to injury to the nerves and blood-vessels, the parts involved often breaking down in ulceration, eventuating in the morbid condition known as **moist** gangrene. When the extremities die as a result of systemic disease, such as diabetes, and disturbance of the vasomotor nerve centers (Raynaud's disease), or a hardening of the coats of the blood-vessels, or obstruction of the same by embolism, conditions that may occur in early life and

adult age, the parts involved wither, turn black, but usually remain dry—hence the term "dry gangrene."

Senile gangrene is the term applied to the devitalizing disease when it appears in advanced life. Here it is due to arteriosclerosis, or plugging of the blood vessels. The morbid change usually commences at the toes, and gradually extends upward to the ankle joint, at which point the line of demarcation usu-

Fig. 27.—Gangrene of the Foot.

ally becomes manifest, in case the resisting powers of the system are sufficiently vigorous to hold the disease in check; otherwise the patient will soon show signs of vital depression, as a result of the absorption of septic matter, and will die from physical exhaustion.

As before stated, a part dies for want of nutrition. In strangulated hernia a knuckle of intestine becomes constricted at the external or internal abdominal ring, and if not liberated the protruding portion will become gangrenous within a few hours. A broken limb may be lost through gangrene by applying the roller bandage so tight that the circulation soon becomes constricted. Ulceration and sloughing frequently follow the cutting off of the blood supply to a part, whether it be the nose, eye, or the extremities.

Gangrene of the nose, ears, and of the extremities, will

sometimes follow the prolonged use of ergot, especially if the individual be anæmic and otherwise in feeble health. The continued use of the drug is supposed to cause an irritation of the vasomotor nerves, resulting in contraction of the arterioles. The gangrenous state, as a rule, is preceded by numbness, pain, cold, and formication in the affected parts that may extend over a considerable period of time. At length the line of de-

Fig. 28.—Gangrene of the Toes. (*Howe.*)

marcation becomes manifest, showing the limit of dead tissue. Just above this line amputation should be done, in cases where this is feasible.

The continued use of carbolic acid solutions on the fingers and toes over a considerable period of time will often result in dry gangrene, by constringing the superficial blood vessels. The line of demarcation should be waited for before removing the devitalized part.

That form of the disease known as **hospital** gangrene is not necessarily confined to traumatic cases, as individuals are liable to attacks of the ailment whose surroundings are unsanitary and the diet such as will not support the vitality of the body. The parts affected usually break down in ulceration, and very often slough. The fetid odor that emanates from a sloughing, gangrenous sore, once inhaled, will ever afterwards be distinguished from that coming from other putrefactive wounds.

Every effort is made in hospitals and other institutions set apart for the care of the sick and injured to isolate a patient suffering from gangrene from obstetric cases and others suffering from traumatism, as the germ-bearing effluvia is more than likely to carry infection in its wake.

Diabetic gangrene usually commences at the toes in a sore or wound. however trivial, but does not spread rapidly at the outset. This form of the disease is commonly met with in adult life, and is the direct result of poor nutrition, superinduced by vasomotor disturbance and low vitality. The character of the part affected may be dry and shriveled, and in other cases, where the devitalizing process is active, it may take on the nature of moist gangrene. If the interference with the circulation is pronounced throughout the lower limb, the latter becomes cold and edematous, and gangrenous spots appear in several places at about the same time. Not infrequently the patient lapses into a rapid decline, and. soon becomes moribund and at last dies.

The symptoms commonly observed in a slow death of the tissues of the extremities are numbness, or the blunting of sensibility, formication, and coldness of the part affected; the tissues become withered and finally shrink tightly upon the osseous structure in dry gangrene. In the moist form the affected parts become puffy; ulceration sooner or later sets in, followed by sloughing; the necrotic tissue giving rise to an offensive odor. The surrounding tissues are edematous, mottled at first, finally turning a dark brown or black color. Fever of a low grade is a common symptom in cases characterized by swelling and extensive suppuration in the part affected. Thirst is a feature in these cases, and the tongue is coated with a yellowish-white fur; the breath is offensive, and digestive disturbances are usually present. A typhoid condition of body is' frequently provoked by the rapid absorption of putrid matter, in severe cases. The secretion of the kidneys is often deficient, and exhaustive diarrhœas not uncommon. The line of demarcation often referred to in gangrenous diseases is the limit of healthy tissue that exists between the healthy and diseased portion of the limb; or, in other words, it is the limit of the display of vital activity in the diseased part.

Treatment. The treatment of gangrene will vary to meet the requirements of the several causes producing the morbid process, yet the principal objects to be attained are to stimulate vital activity in the part affected at the outset, to keep the necrotic tissue aseptic after ulceration has set in, and to fortify the system against the absorption of putrid matter and lapsing into a state of adynamia. Vitality in a part threatened with gangrene may be restored by friction, massage, the application of dry heat, and stimulating liniments. If the morbid process has advanced to the point where the cuticle is easily separated from the true skin, and the affected part becomes puffy, and crepitates under pressure (emphysema), and the color has changed to a purplish black, with a foul odor, the tissues are absolutely dead, and amputation should be resorted to without delay.

The second indication is provided for in cases where the part involved has broken down in ulceration, with a tendency of the tissues to slough, where operative measures are refused, by applying potent antiseptic and deodorant agents directly to the suppurating sores. For this purpose the favorable action of the following agents should be considered: Powdered charcoal, salicylic acid, boracic acid, salol, and solutions of bromine, bichloride, chloride of lime, kreso, creolin, asepsin, and permanganate of potassium.

The third indication calls for the internal administration of such remedies as the individual case may require. To guard against the absorption of putrid matter the action of specific echinacea, baptisea and sulphurous acid are worthy of notice. A red or brown coated tongue will call for dilute hydrochloric acid, and flagging vital powers will demand small doses of quinia, strychnia, and iron, in connection with good nourishing food. This should comprise rich soups and broths, custards, lemon sherbet, ice-cream, eggs, fowl, tender steak, cordials, fruit jellies, and other appetizing dainties that the patient may crave. The action of the bowels and kidneys should be kept normal.

While the treatment given above may be applicable for most of the forms of gangrene, yet there are some varieties of the morbid condition that require special treatment. Gangrene of the intestine may be mentioned as one of these varieties,

and gangrene following diabetes and Bright's disease of the kidneys may also be noted as needing special attention. The former requires excision of the part involved, when not too extensive, after which the healthy ends are united with the Murphy button, or with iron-dyed silk sutures, as explained in the article on intestinal anastomosis. Diabetic gangrene requires the internal administration of such remedies as are known to check the secretion of sugar by the kidneys, and to stimulate to healthy functional activity the organs interested in the process of digestion and the assimilation of food. To accomplish the end desired the action of arsenic, iron jaborandi, the digestive ferments, dilute hydrochloric and aromatic sulphuric acid, codein, strychnia, and brewer's yeast should be considered. Many of the medicinal agents mentioned will prove beneficial in the restoration of the vital fluids of the body when deteriorated by the waste produced by Bright's disease.

In cases of gangrene of the extremities where the destructive process is exceptionally active, it is in no wise necessary to wait for the line of demarcation to manifest itself before resorting to amputation. To delay the operative work would be at the risk of sacrificing the life of the patient through the absorption of septic matter. Besides, it is possible to stay the further progress of the disease by lopping off the necrotic portion early in its progress. Prof. A. Jackson Howe makes this statement in his Art and Science of Surgery: "When the line of demarcation forms, the vital processes have begun a voluntary amputation; and, if let alone, will complete the separation, the bones becoming disarticulated at the nearest joint. And to use the knife is merely to hasten what nature has prominently in view."

PART THREE

Chronic Infectious Diseases

TUBERCULAR DEGENERATION

A tubercular diathesis is a factor often to be reckoned with in doing operative work. The morbid state is due to a depraved condition of the system, which may be the result of heredity, bad hygiene, occupations that are damaging to health, infection, and to the enfeebling effect of other constitutional diseases, as syphilis and typhoid affections. Tubercular matter usually appears as cheesy deposits, granular in form and appearance, except in cases infected with tubercle and pyogenic bacilli, when the morbid product resolves itself into a puriform mass, which is rapidly destructive to surrounding tissue.

When systemic infection occurs through the inhalation of tubercular bacilli, the disease manifests itself in some part of the respiratory tract; when the germs of the disease are taken into the system through the medium of infected food, such as milk and meat, the disease attacks some part of the digestive tract. The disease is not transmitted by direct contact, as frequently as is supposed by people in general.

In surgical work the disease is frequently met with in the lymphatic glands, the skin, bones, the serous membranes, joints, testicle, omentum, and the intestinal tract.

Local or general attacks of tuberculosis generally occur in persons of feeble vitality, a morbid state that is inherited or brought about by some form of exposure. This being the case, the treatment will be in the main supportive. The feverish state, the loss of flesh and strength, together with a faulty digestion and a capricious appetite, are systemic and functional wrongs that every case will present in some degree, which can be relieved by living and exercising in the sunshine and fresh air, with a properly regulated diet, and remedial agents composed of stimulants, tonics and peptics.

Treatment: One drop of Fowler's solution of arsenic every three hours, taken in a small teaspoonful of the compound

syrup of the hypophosphites, administered on alternate days with
teaspoonful doses every three hours of a solution of ferri cit-
ratis (thirty grains to water four ounces), will prove of much
benefit in feeble and anæmic states. Three to six drops of
dilute hydrochloric acid in water, every three hours, and the
sixtieth of a grain of strychnia one hour after meals, improves
the digestion, and whips up a flagging appetite. If the food is
slow of digestion, resulting in fermentation and gaseous dis-
tention of the bowels, give teaspoonful doses of the following
mixture every two or three hours:

℞.
  Pan-peptic Elixir (Sharp & Dohme) .... ℥ iij
  Benzothymol .... ℥ j
M.

This mixture is of special value when there is present ex-
hausting diarrhœa, resulting from gastro-intestinal indigestion,
a condition frequently met with in tubercular states of the sys-
tem. Cod-liver oil acts kindly in some cases, but a pure olive
oil will accomplish as much as a tissue builder, and does not
provoke gastric disturbance. It may be taken pure, in
teaspoonful doses after meals, or combined with the food while
eating.

The diet should be varied to favor the individual case. Usu-
ally the patient does well on nicely broiled beefsteak, fowl, oys-
ter stew, mutton broth, well cooked pigs-feet, especially when
pickled, toast and graham bread, jellies and custards, butter and
ice cream; but should partake sparingly of vegetables.

Night sweats are controlled with a few drops of aromatic
sulphuric acid in water at bed time, or a wine-glassful of cold
sage tea, while one one-hundredth of a grain of sulphate of
atrophia will not disappoint in its action.

Tubercular affection of the lymphatic glands is a morbid
condition incident to the early stages of life. The primary
manifestation of the disease is usually observed in the submax-
illary and cervical regions, although the axillary and the ingui-
nal regions are frequently the seat of tubercular adenitis. In
the latter region the tubercular state will have to be differen-
tiated from lymphatic tumefactions resulting from syphilis,
gonorrhœa, glanders, cancer, and allied affections, producing an
infectious state of the systemic fluids.

Heat, pain, and swelling, with tenderness on pressure, are the common symptoms usually presenting in tubercular adenitis, with the addition of fever and fluctuation should the case go on to suppuration.

In prescribing a treatment for tubercular adenitis, too much reliance should not be placed on medicinal agents for topical application; however, the systemic taint demands general antiseptic remedies, tonics, and stimulants, together with plenty of exercise in the open air. The following mixture will act kindly as a general tonic and appetizer:

R.
    Muriate Tr. of Iron .... ʒ ij
    Dilute Phosphoric Acid .... ʒ ss
    Syrup Simplex, q. s. ....fl. ʒ iv
M. Sig.—A teaspoonful every three hours during the day, with a swallow of water after it.

On alternate days take three drops of Fowler's solution of arsenic in a little water after meals. Sulphide of calcium in doses of one grain three or four times a day, or small doses of sulphur administered one hour after meals every other day will give good results in debilitated states of the system. Remove the infected glands by operative measures.

The prognosis is generally unfavorable; the patient usually succumbs within a period of three years.

Tubercular degeneration of the joints, especially of the hip and knee articulations, are of frequent occurence. The disease is most frequently observed in children and young adults. The morbid state may be the result of traumatic injury, aggravated attacks of arthritis, and from a general tubercular state of the system.

The symptoms of tubercular arthritis are heat, pain, swelling and deformity, limp, spasm of muscles and limit of motion. Fluctuation will also be present if the morbid state goes on to suppuration. In tubercular abscess the pus is usually very thin and milky in appearance, and is surrounded by a layer of thick granular tissue filled with tubercles.

The prognosis depends upon the age and the general state of health of the patient, and the severity of the attack, especially as to whether complications exist or not.

The treatment consists in immobilizing the part in a plaster-

of-Paris cast, with enjoined rest if seen early in the attack. If the case has gone on to suppuration, evacuate the pus, and remove any and all dead bone tissue with the curette. The traumatic cavity should be thoroughly washed out with a one to two thousand bichloride solution, after which, it should be filled with an emulsion of iodoform, prepared by adding one-half ounce of iodoform to about four ounces of hot glycerine, the joint should be enveloped in a layer of cotton batting and bandaged, extension being always applied when possible, and the in-

Fig. 28½.—Tuberculosis of the elbow joint. (*Farnum.*)

jured part kept at rest. If deformity exists it should be relieved by mechanical or operative measures; aggravated cases often require the extensive cutting of contracted muscles, tendons, and fascia before the injured part can be made to assume its normal position.

The testicle is frequently the seat of tubercular deposit, and it is observed usually in men under thirty years of age, although very young children and men advanced in life are not exempt from the morbid state.

It is often observed in men suffering from phthisis, and other diseases that greatly enfeeble the system. The disease is prone to attack the epididymis and the areolar and fibrous tissue of the testicle, where it appears as hard, nodulated or shot-like granulations, which in many cases, soften or break down, resulting in abscess formations. The suppurative process may extend to the skin through which the pus may find its way, later leaving a fistulous opening.

The symptoms present in tuberculosis of the testicle are heat, pain and swelling of the gland, together with a heavy dragging sensation in the scrotal and perineal region, which at times is almost unbearable.

Little good can result from the topical application of any of the reputed stimulating and tonic remedial agents often recommended in the morbid condition. In the early stages, anodyne and cooling lotions afford relief to the patient, as does suspending the testicles in a sling. The following mixture will prove a comforting and cooling agent in these cases:

R.
Muriate of Ammonia .... ℥ iij
Tr. of Opium .... ℥ iss
Aqua Dest., q. s. ....fl. ℥ vj
M. Sig.—Apply to the affected testicle every two or three hours.

Excision of the gland should be resorted to as soon as the diagnosis establishes the fact that the organ is tubercular. To delay its removal hazards the life of the patient from extension of the disease to other vital parts.

Tuberculosis of the kidney is usually secondary in character, the disease being the result of general infection, and appears in the form of miliary tubercle, or as a nodule or tumor varying in size from a marble to that of an egg. The disease is usually secondary to attacks of the bladder and prostate gland.

If the disease has entered the pelvis of the organ, the papillæ are the parts usually first attacked, the infection extending from below along the course of the urinary passage. Soon the pelvic structure of the kidney breaks down and fills the cavity of the pelvis with cheesy deposits, blocking the ureter, giving rise to the morbid state known as pyonephrosis. The disease

is incident to all stages of life, men being more often afflicted with the disease than women.

The symptoms indicating tubercular disease of the kidney are somewhat obscure; in pronounced cases there is a history of the tubercular state, affecting some other part of the system; there is some pain and tenderness on pressure; the urine may contain pus and blood, shreds and epithelium, also tubercular bacilli, which are of marked diagnostic value.

A supportive treatment should be advised in all cases, together with good food, sunshine and fresh air. Iron taken in alternation with Fowler's solution of arsenic will be of benefit, especially to the feeble and anæmic. Calcium sulphide in grain doses, three times a day will prove of value in low grades of the system. The patient should be encouraged to bathe in and drink freely of sulphur springs water.

If the case has gone on to suppuration, incision and drainage, or excision should be advised, except in grave states of the system. The prognosis is unfavorable.

The prostate gland is often the seat of tubercular disease; and from this glandular structure the disease usually extends to the bladder, through the continuity of tissue. These organs may be the seat of the primary attack, but the morbid state is more likely to be secondary by extension of the disease from adjacent parts.

The prostate, when attacked by tuberculosis, rapidly breaks down, forming abscesses, which usually discharge through the perineum. Multiple ulcerations of the mucous structure of the bladder soon follow after the disease attacks that organ; this morbid state gives rise to frequent and painful micturation and hematuria, cystitis, and distressing tenesmus. Tubercle bacilli will be detected in the urine, and the ulcerative state can be determined by the cystoscope.

To improve the general health of the patient by giving strict attention to hygiene, is of the utmost importance. The functions of the skin, kidneys, and bowels should be kept normal; the body should be bathed daily in sulphur springs water, when possible, or in salt water, and the patient encouraged to drink freely of lithia or sulphur spring water, when suffering from severe attacks of cystitis.

Any sytemic enfeeblement should be corrected by such peptic and tonic remedies as each individual case will suggest. Usually soluble citrate of iron, Fowler's solution of arsenic, Lloyd's fluid hydrastis, and small doses of strychnia given in alternation will prove of great benefit in these cases. The viscus should be carefully irrigated three times a day with the alkaline solution, diluted one-half with sterilized water, or a five per cent solution of boracic acid in water. Benzoate of guaiacol in ten grain doses, administered in capsules one hour after meals, acts kindly in tubercular affections of the genito-urinary organs.

As soon as it becomes evident that the prostate gland is in a state of suppuration, the abscess should be opened at once and the suppurating cavity washed out with the alkaline solution, full strength, several times a day, until all morbid matter is well cleaned out, when iodoform emulsion, recommended in the treatment of tubercular joints, should be injected into the traumatic cavity; this should be repeated twice a day, last at bed-time. Little good results from cauterizing the ulcerative surfaces of either the prostate or bladder, as has been recommended by some surgical writers; nor is cystotomy or excision of the viscus advised, for if the disease has so far advanced as to justify such heroic measures, other vital parts are likely to be seriously complicated.

The prognosis can be considered unfavorable from the standpoint of experience.

One of the common seats of tubercular disease is in the large, bony structures of the body. The disease, when located in these structures, is of especial interest to the surgeon, who has to take the morbid state into serious consideration when adjusting fractures, reducing dislocations, or performing resections.

The tubercular state of a bone may result from a traumatic injury of the part, the disease lying dormant in a lymphatic gland in close proximity to the injury, and speedily transmitted to the traumatism through the process of inflammation; or the patient may have been previously suffering from general tuberculosis, especially of the joints, when the disease would be transmitted by continuity of structure.

The disease usually begins in or near the ends of the long bones; either in the epiphysis or near the articular cartilage.

The infected part of the bone soon becomes red and hyperæmic, and the tubercular mass appears a reddish-gray or a cheesy-yellow in color. Separated pieces of bone of various length, called sequestra, are frequently found on the inner or medullary part of the affected bone, which are thrown off or separated by the necrotic process.

When the shaft of the long bones becomes the seat of tubercular disease, the morbid state is usually observed in children, as is the tubercular attack of the bodies of the vertebræ.

The treatment of tuberculous disease of the bones is both general and operative. The general health will need to be sustained by tonic and stimulants; good food and plenty of exercise in the fresh air. The dietary and remedial measures mentioned in the treatment of general tubercular conditions will prove of great benefit in the morbid state of the bones.

Operative measures usually demanded in tubercular affections of the bones, consist in removing the necrotic tissue by curettement, resection and amputation. To remove a sequestrum of bone, it will be necessary to drill or channel the shaft sufficiently to admit of its extraction with a pair of forceps, after which, the necrotic surfaces are to be curetted and irrigated with bichloride solution, one to three thousand, the cavity injected with iodoform emulsion, the part is then snugly bandaged and placed at rest.

ACTINOMYCOSIS--LUMP JAW

Actinomycosis is one of the grave parasitic diseases that both man and beast are subject to, and is characterized by subcutaneous tumors that form slowly, but soon break down, forming suppurating abscesses. The parasite gains entrance to the circulation through some abrasion or traumatism, the gums being a common area or field for infection, owing to abrasions so frequently occurring around loose and decayed teeth; this being the case the disease is more frequently manifested about the jaws and neck. Once the suppurating mass is open, it is not inclined to heal, but the disease seems to spread to adjacent tissue through the multiplication and circulation of the infective parasite, which is known as the ray fungus or Actinomyces bovis.

The disease is so virulent that once it breaks out in a herd of cattle it is but a short period of time till the entire lot is infected.

Treatment. The treatment consists in the administration of full doses of echafolta, and sulphide of calcium in the early phases of the disease, with strict observance of hygienic precautions, together with good food and plenty of fresh air and sunshine. Once the suppurative process sets in the mass should be incised and thoroughly curetted, after which the traumatic surfaces should be cleansed with the following mixture;

℞.
　Pulv. Borax .... ℨ ij
　Salicylic Acid .... ℨ j
　Glycerine .... ℥ ij
M. Sig.—Apply to the wound twice a day, on a cotton applicator.

In advanced cases give full doses of iodide of potassium three times a day, or one-sixth grain doses of protiodide of mercury one hour after meals, and continued for ten days, when Fowler's solution of arsenic in two drop doses taken in water should be substituted.

SYPHILIS

Syphilis is a venereal disease, infectious in character, imparted by contact with an open sore, or it may be the result of heredity. Sexual intercourse is the common method of transmitting the disease; however, the examining finger of the surgeon frequently becomes infected, should the cuticle be abraded, if it comes in contact with the virus of an open sore during operative procedures. Seldom, if ever, is the disease contracted through the medium of infected clothing, although it is frequently imparted from adults to children through the act of kissing.

Chancres are open sores, the local manifestation of syphilis. There are two varieties, the soft chancre (chancroid), and the hard, or true chancre. The former is the result of mixed infection, and is caused by inoculation from the virus of a similar sore, but contains no poison that sets up a train of systemic changes. There is no period of incubation, the disease commencing a day or two after the infectious intercourse; as small vesi-

cles, these soon develop into pustules, which later form slough-ing ulcers.

As stated before, there are no systemic changes observed, arising from these local inoculations, that is, there are no second-ary or tertiary manifestations, although the local sore may as-sume a phagadenic condition, causing buboes of a sloughing character, that may give rise to morbid conditions that may threaten the life of the patient.

One feature of chancroid is its disposition to spread through sloughing; the edges are often undermined and the sore sends forth an abundant purulent discharge.   There is no induration of the edges of the sores, and very little pain, although the sur-rounding tissue is sometimes very sensitive to the touch.

Another peculiar feature of chancroid is its likelihood to occur from inoculation while the patient is suffering from a siege of constitutional syphilis, and there will be as many sores as there are separate inoculations.

Hard Chancre. The hard chancre is the local manifestation of constitutional syphilis.   It appears at the point of inoculation, as

Fig. 29.—Hard Chancre. (*Howe.*)

a small, hard nodule, which later undergoes degeneration, forming an ulcer. Unlike chancroid, there is but one sore, the edges of which are usually smooth, hard, and not undermined.

The ulcer discharges a thin, foul smelling secretion, usually scanty in quantity. The hard chancre generally appears about twenty-five days after a suspicious intercourse, although the period of incubation may vary from ten to sixty days. About the time of its erosion, the inguinal glands may show some enlargement, but seldom go on to the degree of suppuration.

Another characteristic feature of hard chancre, is its disposition to keep within the limit of the small area, although the extent of the sloughing will depend largely on the general health of the patient. An enfeebled state of the system makes it possible for the local sore to take on a phagedenic condition resulting in destruction of tissue, endangering the patient's life through infection.

The true chancre does not appear at the first invasion of the body with the virus; the system is sorely impressed for some days before the presence of the chancre becomes manifest. It may be stated here that a person having constitutional syphilis once, is immune from future attacks of the disease, but may have soft chancre as often as the system is exposed to the inoculating virus. It usually requires about three years for the disease to pass through its several stages, and in many cases the disease produces local effects that last through life. In congenital syphilis there is no primary sore.

From the third to the fifth month following the inception of the disease, the secondary symptons are ushered in, and are noted by enlargement of the lymphatic glands, eruptions of the skin and mucous membranes, iritis, and falling of the hair. Preceding these conditions, there is increased temperature and restlessness, which is relieved after the appearance of the eruption and ulceration of the throat. The eruptions are usually copper-colored and appear on the face, neck, breast and forearms. About this time the patient will suffer from stiffness and pain in the muscles and bones, loss of appetite, constipation, headache, loss of flesh, night sweats, and in fact, he is entering a period of a general decline.

No one having had the constitutional form of the disease

should marry for at least three years succeeding the disappearance of the tertiary symptoms of the malady.

The tertiary stage of the disease is characterized by ulcers appearing on different parts of the body, glandular enlargements, gummy tumors, the result of inflammatory deposit, causing nodes, caries, or necrosis of bone; ulcerations of the tongue and throat, and dry scaly patches appearing on the palms of the hands and the soles of the feet. A person suffering from these latter manifestations will not impart the disease to others by intercourse, or other means by which the disease is usually conveyed; however, the progeny of a parent suffering from these latter symptoms, may show evidences of the disease at birth or very soon after, in papular eruptions of the skin, mucous patches in the mouth, and ulcers on the lips, and soon go into a general decline.

Treatment of "local syphilis" does not of necessity require constitutional remedies; however, the feebly inclined may take peptics and tonics for a few days to some advantage. The following is commended:

R.
    Fowler's Solution .... ℥ ij
    Syrup of the Lacto-Phosphate of Lime ....fl. ℥ vj
    M. Sig.—A teaspoonful after meals.

And:

R.
    Pan-Peptic Elixir (Sharp & Dohme) .... ℥ iij
    Benzothymol .... ℥ j
    M. Sig.—A teaspoonful every three hours during the day.

The local sore is to be kept clean by frequent washing with borax water; wipe dry and apply the following powder:

R.
    Iodosol .... ℥ j
    Powdered Borax .... ℥ j
    M. Sig.—Sprinkle over the chancre every three or four hours, last at bed time.

Should this prove inefficient on account of the sponginess of the part, touch the ulcer three times a day for a week with the following:

℞.
   Powd. Sulphate of Copper .... ℥ ij
   Aqua Dest. ....fl. ℥ ij
  M. Sig.—As above directed.

Seldom will other remedial agents be required if those just mentioned are faithfully applied. If an escharotic should be deemed necessary, use the sulphate of copper pencil once a day, following with one of the above mentioned formulas.

The local sore will heal in about three weeks if properly attended to; however, if the patient be vitally depressed, a little longer time will be consumed. The diet should be generous and nutritious; eggs, beef, and milk served in their various forms, will be commended, and meat and fruit jellies and pickled pigs feet will be taken with a relish. Care should be given to the functions of the skin, kidneys, and bowels, and exercise in the open air should not be neglected.

Should a bubo, or a lymphatic abscess form as the result of absorption of septic matter, open and treat it the same as was the initial sore. If, however, the lymphatic invasion is discovered early, the prompt application of the tincture of iodine, or some one of its compounds will be found efficient to discuss it.

In the treatment of the constitutional form of syphilis, more attention must be given to systemic remedies. The emunctories of the body are to be stimulated to action, by the judicious use of laxatives, diuretics, and baths, and the diet should consist of rich and nutritious food, with plenty of exercise in the open air. Headache and febrile states will be relieved with an occasional five-grain dose of acetanilid, taken dry on the tongue with a swallow or two of water after it, while chills and hectic conditions are to be overcome with two or three drop doses of Fowler's solution, taken in camphor water. To whip up a lagging appetite and promote digestion, the following will be found most useful:

℞.
   Spec. Tr. Capsicum .... ℥ ss
   Fowler's Solution .... ℥ ss
   Elix. of the Glycero-Phosphate of Lime and Soda, q.s.fl. ℥ iv
  M. Sig.—A tablespoonful in a half wine-glassful of water
    every three hours during the day.

Howe's acid solution of iron in five drop doses, taken in a little water, is also a valued remedy for the same purpose.

In the secondary and tertiary stages of the disease, to produce a more profound "alterative" effect, resort to the iodides and mercurials will often bring about the desired effect. A valued formula containing iodide of potash is the following:

℞.
    Iodide of Potassium .... ℥ ij
    Syrup of Trifolium Compound ....fl. ℥ iv
    M. Sig.—A teaspoonful in a half wine glassful of water every
    three hours.

On alternate weeks give protiodide of mercury in one-tenth grain doses, in tablet triturate, every three hours. Ten drop doses of a saturated solution of iodide of potassium is a potent remedy to overcome the ravages of syphilis, taken in a wineglassful of cinnamon or peppermint water; especially is this remedy useful in syphilitic iritis, and other stages of the disease where there is evidence of inflammatory deposits. In connection with this remedy administered internally in iritis, keep the pupils well dilated with a solution of sulphate of atropia, one to two grains to the ounce, two or three drops instilled in the eyes at a sitting, and repeated two or three times a day, last at bedtime. After the pupil is well dilated, it must be kept so to relieve the pain and congestion. In connection with the use of the mydriatic, bathe the eyes with very hot water once or twice a day, and it will be of advantage to the patient to do this just before the instillation of the atropia. It is one of the best means at our command for the relief of pain. The eyes must be shielded from the light by the use of dark glasses, and in bad cases the patient should be kept in a dark room during the acute stage of the trouble. Great benefit may be derived ofttimes, by the internal administration of three to five drop doses of the spec. tr. of jaborandi every two hours in a little water; the agent acts favorably in overcoming ocular spasm.

To arrest the destructive tendency of the ulcers found in the nose, mouth and throat, touch them morning, noon and night with a pledget of cotton, twisted on the end of a dressing probe, dipped in a solution of sulphate of copper, a drachm to the ounce of water, and in the interval spray the ulcer every two hours with the alkaline solution previously mentioned, or use the foling:

℞.
Biborate of Soda .... ℥ ij
Salicylic Acid .... ℥ j
Glycerine ....fl. ℥ij
M. Sig.—Apply to the ulcerated surface every three hours, last at bed time.

Should the ulcer be slow to yield to these applications, the copper pencil used once a day for a week will stimulate the healing process.

To prevent falling of the hair, and to restore it in cases where it has been prematurely lost, the following mixture will be of service:

℞.
Sulphate of Quinine .... ℥ ss
Lactic Acid .... ℥ ij
Rose Water, q. s. ....fl. ℥ iv
M. Sig.—Apply to the scalp once a day with brisk friction.

If the remedy proves too irritating to the scalp, add half an ounce of glycerine to the mixture. The following is also an efficient hair grower, and is in general use:

℞.
Tinct. Cantharides .... ℥ ij
Tinct. Capsicum .... m. xv
Glycerine .... ℥ ss
Rose Water, q. s. ....fl. ℥ vi
M. Sig.—Rub well into the scalp once or twice a day, and shampoo the hair twice a week with tar soap and water.

For the relief of deep seated or periosteal pain during the formation of nodes and gumma, anodynes are indicated, and should be given hypodermically, one-tenth grain of muriate of heroin will prove efficient, repeated once or twice a day. Heat applied through the medium of hot water bottles is both efficient and comforting to the patient.

The treatment of syphilis in children consists in aiding the recuperative powers to throw off the systemic poison, through the medium of good nursing, rich nourishing food, and teaspoonful doses of the following mixture:

℞.
Donovan's Solution of Arsenic .... ℥ ss
Syrup of Lacto-Phosphate of Lime .... ℥ ij
Simple Elixir, q. s. ....fl. ℥ iv
M. Sig.—Taken as above directed.

Especially liable is a child suffering from syphilitic taint to affections of sight and hearing, in the form of corneal inflammation, staphyloma and opacities of the cornea, and otorrhœa, or purulent discharges from the ear, resulting from destructive inflammatory disease of the bony canal. Hydrocephalus is also frequently met with in children suffering from the hereditary form of the malady, and tubercular lesions are not uncommon, and unless the child is fairly vigorous, these affections are apt to lead to a fatal issue.

The treatment of keratitis consists in bathing the eyes in quite warm water once or twice a day, and keeping the pupil well dilated by the use of a drop or two of atropia solution, one grain to the ounce, instilled in the eyes once or twice a day; and for the relief of the corneal opacity, place between the lids morning and evening a small portion of the ointment of the yellow oxide of mercury, or apply a small amount of calomel directly to the opacity once a day. Otorrhœa will demand, in connection with the internal treatment, that the ear be kept clean by wiping out the canal with pledgets of absorbent cotton on a small probe dipped in the alkaline solution, after which apply through a blow tube a small amount of boracic acid or calomel twice a day. For the treatment of hydrocephalus, the reader is referred to another part of this work, where the morbid condition is treated under a separate head.

PART FOUR

Tumors

A tumor is a morbid growth of a circumscribed mass of tissue of the body, and as there are several kinds of tissue that compose the structures of the system, naturally there will be several classes of tumors considering them from a structural standpoint, inasmuch as the tumor structure is the same as that from which it springs.

A tumor may be congenital; nævi are of this class. Then again it may result from traumatism or continued irritation. Tumors are so common with some, that there seems to be an inherited tendency to the morbid state.

Polypi, warts, papillomata, adenomata and carcinomata are considered marked examples of the epithelial-tissue type of tumors; however, the two last mentioned forms often contain so much connective tissue as to seemingly justify some writers in designating them as mixed tumors.

Fig. 30.—Nevus of the Lip. (*Howe.*)

From connective tissue there arise numerous kinds of tumors; of this class fiibromata, lymphomata, myomata, chondromata, osteomata and lipomata are noted examples.

The characteristic features of tumors divides them into two classes, the benign and malignant; the former producing merely a local effect, while the latter seriously affects the general health in connection with the local disturbance. The carcinoma, sarcoma and epithelioma are of this class. These tumor manifestations usually develop rapidly, are painful, involving the surrounding parts, especially the lymphatic glands, and ultimately produce a cachectic state of body, with a liability to a return after extirpation.

The benign growth is devoid of many of the characteristics of the malignant tumor. It is slower of development, is usually encapsulated, is quite movable from its surrounding tissue,

and does not complicate adjacent glandular structures. It often displaces surrounding tissue, but does not produce infiltration.

A cyst is a tumor formation, having a tough fibrous sheath, containing fluid or semi-fluid matter. This form of tumor is divided into three classes, the serous, mucous, and synovial, which differ from each other principally as to location and structure, from which they spring and not so much from the character of their contents.

The scalp, neck, shoulders and eye-brows are common seats of the serous variety, and contain a fluid not unlike the serum of the blood, oily or cheesy matter; when located near parts of the surface, covered with hair; and salivary and jelly-like fluid when the cyst originates from the mucous surfaces; and, as the name indicates, the synovial cyst contains principally synovial fluid.

Fig. 31.—Exostosis of the Tibia. (*Howe.*)

A bursa is a tumorous growth, akin to a synovial cyst. It is found near joints and along the course of tendons, where friction is likely to occur. The fluid enclosed within the sack is the same in character as that found in the synovial cyst. A common site for it to be found is over the patella, where it takes the name of "house maid's" knee.

Another form of tumorous growth, and one springing from bony structures, is called exostosis. This form of tumor is usually found along the course of the long bones, although it may originate in osseous structures from other parts of the system.

Treatment: The general treatment of tumors is by resolvents, caustics, electrolysis, incision and excision. Tumorous growths springing from glandular tissue can be reduced by the application of electrolysis and resolvents; of the latter, iodine or some one of its compounds being, perhaps, the most efficient agents.

Cysts that are pendulous should be freed from surrounding tissue, the pedicle secured by ligature and cut away. In cases where this is not practicable, the morbid mass should be opened,

the contents evacuated, and the secreting surface of the cyst swept over with iodine, or 95 per cent phenic acid; drainage established for large cavities, and dressed antiseptically.

Lipoma or fatty tumors, should be dissected out, unless they are situated dangerously near important nerves and blood vessels.

Sarcomatous growths are to be excised in all cases, where operative procedures are justifiable; as little good results from local applications of electrolysis or medicinal agents; even should operative measures be resorted to, there is a liability of a return of the disease in grave cases.

The treatment of carcinomatous growths should be both local and constitutional. Removal by excision whenever practicable should be the accepted course; otherwise, recourse should be had to devitalizing escharotics, the most efficient of which is butter of antimony, applied to the necrotic surface with a glass rod or applicator, once or twice a week; and should be continued till the morbid mass has been devitalized and sloughed away. Salicylic acid is also a medicinal agent of value in some forms of epitheliomatous growths. It should be rubbed up in glycerine, in various strengths, usually thirty grains to the ounce, and applied to the affected part every three hours. There are several escharotic agents highly recommended for topical application in carcinomatous manifestations, all having some merit if used early in the disease. The arsenical paste made after the following formula is highly recommended:

R.
Pulv. Arsenious Acid .... ℥ i
Ext. of Belladonna .... ℥ ij
Mur. of Cocaine ....
Heroin Hydrochloride, āā .... ℥ ss
Vaselin, q. s. .... ℥ij

M. Sig.—Apply to the surface of the cancerous mass to the depth of one-eighth of an inch, the mixture being spread on a piece of leather or ticking of sufficient size. Let the plaster remain in contact with the surface of the cancer about three hours if the mass is denuded of integument; a little longer time if the skin is intact. Then remove and slough out the deadened tissue by poulticing. Should the mass be not removed in the slough, the escharotic should be again applied as before, but for a shorter period of time.

The necrotic slough may not come away readily and will require the use of forceps and scissors to cut away bands of

anchoring fascia.   This accomplished, the suppurating cavity will be kept free from septic matter with antiseptic washes, the most efficient of which is the alkaline solution.

The general health will demand attention during the treatment of malignant growths; sooner or later there will be evidence of a capricious appetite, with a sallow complexion, and an enfeebled vitality.   Peptics and tonics are then demanded, in connection with a dietary composed of rich, nutritious foods; and as the system is usually in a state of anæmia, arsenic should be taken one week and some preparation of iron (preferably Howe's acid solution of iron) the alternate week.

In extreme weakness, combine Fowler's solution of arsenic with Fellow's compound syrup of the hypophosphites, or the elixir of glycerophosphate of lime and soda; a drachm of the former, to four ounces of the latter, given in teaspoonful doses, as often as may be required.   Fresh air, sunshine and exercise, are also conducive to a vigorous state of body, and should be on the daily hygienic routine.

The only treatment for exostisis is its removal by excision.   There is little danger attending the operative procedure, except it be infection, the possibility of which is increased the nearer the articulations the bony outgrowth is situated. Attempts at removal by resolvents have not proven successful.

The removal of the cavernous variety of nævi is effected by subcutaneous ligation of the vascular mass, and by excision. Efforts at removal by the injection into the spongy growth of per-sulphate of iron and other powerful astringents, with the expectation that these agents would constringe the vascular tissue, will prove disappointing.

The pigmentary nevus of moderate size, involving merely the skin and superficial fascia may be removed by plastic methods or punctured with a moderate sized knitting needle, heated to a dull red heat, and if small in size, the constant application of collodion is very effective, by constringing the superficial blood-vessels.

FIBROMA

A fibrous growth is composed of fibrous connective tissue and varies in shape and size; they are usually hard to the touch

and very painful, when located near important nerve-trunks. Fibrous tumors are benign in character and have their origin in any part of the body where fibrous tissue is to be found.

There are two classes of fibromata, the hard and soft; the former has but few cells and is dense and white, usually globular in form, and is rather slow of growth. The soft variety develops more rapidly on account of a rich blood supply and often undergoes degeneration. Morbid states of the skin, following

Fig. 32.—Fibroma of the sub-maxillary region, of twenty years standing.

the formation of scar tissue, are generally fibrous in character, but do not assume growths of large size.

Smyptoms may be absent, unless the growth is located in tissue abounding with nerves, when pain will be a feature, due to pressure or the involvement of some important nerve trunks.

Treatment: The treatment of fibrous growths is their removal, when possible, which should be done during the early stages of the morbid condition.

The X-ray and the Finsen light have been tried for their

resolvent effect upon the growths, but with results unfavorable to their continued use.

Fig. 33.—A fibro-cystic tumor, growing from the coccy-geal region of an infant (congenital). Removed sixty days after birth. Patient fully recovered.

LIPOMA

Tumors of this variety are benign in character, being composed of a structure similar to that of adipose tissue. They vary in size from a small pea to that of a human head and even larger. They are generally of slow growth and not very painful, except when the tumor involves some important nerve or dense structure, when it causes distress by pressure.

Common sites for this form of growth are the back, shoulders neck and groin. They have also been observed in the palm of the hand, soles of the feet, meninges of the brain and spinal cord, and abdominal viscera.

Owing to the nature of the surrounding structures, these fatty growths assume various shapes and forms. They are

nonvascular, although the immediate tissues surrounding the fatty mass often teem with blood-vessels.

All but the diffuse form are encapsulated; this variety is noted for sending out into adjacent tissue prolongations of the fibrous sheath, that frequently lead to a recurrence of the growth, if any part of it is left behind in attempts to remove it.

Lipomatous growths do not always appear singly; multiple fatty tumors are frequently observed in the axillæ, neck and groin.

Unless the growth is of considerable size or involves important vessels and nerves, diagnostic symptoms are generally wanting; however, if the tumor be large and occupying a position of exposure, the overlying integument usually becomes inflamed, followed by abrasions or ulceration and not infrequently suppuration.

It often requires an exploratory incision or puncture into the developing growth to determine its true nature or to differentiate it from similar looking growths of the cystic or sarcomatous variety.

Treatment: Operative treatment in all except the diffuse variety is the only method that can give any promise of a complete cure, and the individual case will have to determine in great measure, the nature of the operation to be executed. In large growths, the skin flaps should be formed from the sides, near the base and in reflecting them back, the capsule of the tumor should be exposed and used as a guide during the enucleation.

The operative work should be done under strict antiseptic precautions to prevent, if possible, post-operative infection. The work can usually be done under local anæsthesia.

MYXOMA

A myxoma is a soft tumor, usually found springing from mucous membrane; the growths, however, have been observed in the breast, skin, uterus, the meninges of the spinal cord and brain. The characteristic feature of this form of growth is the nature of its contents, it being of the consistence of jelly or mucin.

The tumors vary in form and size from the nodulated growth the size of a pea to a peduncleated formation several

inches in length, often observed extending from the uterine walls.

Polypi of the nose are of the nature of a myxoma and like growths of this form springing from other mucous surfaces, they are usually of slow growth.

The accompanying symptoms presenting with this form of tumor vary in character according to the location of the growth; if they are found in the nose, bladder, or uterus, local congestion and hemorrhage are apt to be the chief features of their presence, while nervous disturbance follows the presence of the growth when located in the spinal canal or within the cranium, due largely to pressure.

The treatment is entirely surgical and consists in removal of the growth when feasible, otherwise, when it can be reached it should be incised and drained.

. MYOMA

A myoma is a tumor composed mostly of muscular tissue. They vary in size and are chiefly located in the genito-urinary organs. When located in the uterus, these growths are known as uterine fibroids, and frequently attain a large size and are composed of fibrous, as well as muscular tissue. A feature of these growths is their density. Their form is usually globular, although they often assume a nodular exterior.

The symptoms, while the growths are small, are sometimes wanting. After the growth has assumed the size of the fist and larger, considerable pain is experienced at times and the functions of the bladder and bowels are interfered with, a condition due mostly to pressure. Uterine myomata often occasion exhausting hemorrhages after they have assumed considerable size and always complicate pregnancy, should this take place during the existence of the growth.

Not infrequently the morbid growths undergo some form of degeneration when they develop in individuals of a strumous habit of body.

Treatment: Treatment of these morbid growths is their early removal, when such a course is feasible. Prof. A. J. Howe at one time advocated injecting uterine fibroids (myoma) with thuja to bring about involution of the morbid growth. Six to

ten drops of the specific tincture was added to twice the amount of distilled water and injected into the depths of the fibrous mass every four or five days for a period of two or three months, using a syringe with a long, strong point, suitable for the purpose. This form of treatment seemingly did good in some cases, but not to the extent that it became generally adopted by surgeons. In connection with the above treatment, mangifera indica was given internally in ten drop doses four or five times a day. Iron and arsenic were also advised in anæmic states, in doses suited to the individual case.

The electric current has also been recommended by many surgeons who have adopted this form of treatment; it is only applicable to the early stages of the morbid condition and then only in such cases as show a modified vascular connection.

CHONDROMA

Tumors springing from bone or glandular tissue and composed of hyaline or fibro-cartilage are called chondroma. Common sites from which these tumors spring are the joints of the fingers and toes, where they appear in multiple form.

This form of growth is benign in character, and is of slow development. When the tumor springs from glandular tissue it often assumes the nature of a sarcoma or fibroma and not infrequently undergoes active degeneration.

The symptoms accompanying chondromata are deformity, local swelling, distress and sometimes pain.

Treatment: Treatment consists of incision, excision and in affection of the feet and hands, amputation in aggravated cases.

OSTEOMA

Osteoma is a tumor composed of bony tissue. Two varieties are commonly recognized, owing to the nature of their formation; one is very hard and generally springs from the surface of the flat bones, or the shafts of the long bones; the other variety is spongy in character and is commonly found near the end of the long bones. The latter is more vascular and develops more rapidly than does the former. Not much pain attends the development of the dense growth, except it involves

important nerves, while more or less disturbance of articular surface is caused when the growth is large and located near the joints, and pain and disturbance of function when the tumor projects into certain cavities, as the nose and orbits or presses against important organs.

Fig 34.—Exostosis of the Femur. (*Howe.*)

Treatment: The treatment of these osseous growths will be entirely by surgical measures and will consist of excision when they appear as an exostosis; bony outgrowths of bone, and odontoma—a hard osseous tumor springing from the alveolar process; and amputation when the morbid condition seriously cripples the extremities.

SARCOMA

Sarcoma is one form of malignant growth, having for its special characteristic prolific cell development of various forms and sizes. Thus there is the small round cell, having a pinkish nucleus, with little intervening stroma; large round cells, which are very closely packed. The spindle shaped cell, and the giant cell, having numerous nuclei grouped together, and numerous other forms of cells usually found in these mixed tumorous growths.

Sarcomata composed of the small sized cells are usually more actively malignant than are the other forms.

Trauma seems to be the most common cause of development, hence the growth is apt to appear at most any age, while carcinoma does not, as a rule, appear until after middle life. Some forms of sarcoma so closely resemble carcinoma to the naked eye, that the aid of the microscope is required to establish a true diagnosis.

Growths of this nature are abundantly supplied with blood, hence develop very rapidly, especially when their origin is in the breast, deep muscular structures, liver and kidneys.

The morbid growth has no respect for tissue in which to develop, attacking skin, muscle, tendon, glandular and osseous structures alike. In their course of development they assume various forms and consistency; thus they may be oval, round, or lobulated, and hard and scirrhus-like, or soft and spongy; often filled with a straw-colored fluid; occasionally resembling a thin, jelly-like substance. Of osseous structures, the morbid disease most frequently attacks the femur and maxillary bones. The degenerating disease often causes such rapid destruction of these parts that the loss of life and limb rapidly follow severe attacks.

The malignant nature of the disease often causes an outbreak at some distant part of the body, even after the part has been removed where the disease had its origin.

The symptoms accompanying the degenerating disease vary in kind and intensity, depending upon the location and the virulency of the attack. In quite well developed cases there is heat, pain, redness and swelling, appearing as local symptoms and as the disease progresses, the patient becomes anemic from loss of appetite, sleep, and rest. There will be periods of hectic fever followed by night-sweats and soon there will be a rapid decline from secondary developments, when death will soon end the scene.

Treatment: The early removal of sarcomatous growths gives the only promise of a cure. Other methods of treatment have been tried with varying degrees of success. Dr. Wm. Coley of New York, suggested the use of serum antitoxin of erysipelas by injection, but with such indifferent results that the treatment failed to receive needed support from the medical profession to make it popular.

In turn the X-ray, radium, and the application of the Finsen light have been faithfully used to hold in check the ravages of the disease, but the ultimate results have not been such as to merit their continued use.

GLIOMA

Glioma is the name applied to malignant sarcoma of the delicate supporting structure of the nervous tissue known as neuroglia. The morbid growth may spring from any portion of the larger nerve trunks, the brain and spinal cord being common seats of the disease. These growths do not attain a large size as a rule, and their color is similar to that of the tissue from which they originate. They are generally semi-solid in character and slow of growth.

The symptoms usually observed in glioma are nervous irritation, pain and functional derangement; the severity depending upon the size of the tumor and its location.

Treatment: The treatment of this form of tumor is not amenable to the action of remedies and few cases present where operative measures are possible of execution. If the growth is located near the external surface of the brain, it is possible to excise it, for its location can usually be determined by the functional disturbance caused by pressure upon important nerve centers. True glioma commences in the connective tissue surrounding the nervous tissue of the brain and spinal cord, but never has its origin in the meninges of these important structures.

NEUROMA

A neuroma or nerve tumor is not of common occurrence. The morbid condition may follow the division of a nerve or an injury of a lacerated nature; in many cases the cause is obscure. The growth may spring from the sheath of the nerve without involving the nerve fibers, or it may form in a stump, when it often attains a considerable size. In the former, the pain and other disturbances experienced by the patient are due to pressure, while in the latter the distress is more likely to be caused from direct irritation of nerve fibers.

These nerve tumors are usually of a fibrous nature, al-

though they may have the formation of a myxoma and sarcoma. Pain and a tingling numbness are common symptoms accompanying the morbid state; however, paralysis and even atrophy have been known to follow marked cases of nerve pressure.

Treatment: Not much relief from pain and distress can be expected from the use of medicinal agents, taken internally or topically applied. The pain may be assuaged temporarily by an occasional hypodermic injection of heroin, introduced near the seat of distress; but the treatment that will give promise of a cure will be entirely surgical and consists in the removal of the growth. If it is located within the sheath, this should be opened and the nerve seized with a dressing forcep and drawn upon while it is dissected free from the nerve fibers with small scissors or bistoury, care being taken not to sever the nerve trunk during the dissection.

The neuroma forming upon the end of a divided nerve-trunk may be removed by the double flap method, as advised by Senn, with the section containing the growth cut away, the flaps are approximated and fixed with a fine catgut suture.

The operative work may be done on superficial nerves under local anæsthesia, otherwise chloroform should be used. All work should be done under strict antiseptic precautions to insure success.

ANGIOMA

Angioma is a tumor composed of blood vessels, either arterial or venous, and in some cases a net-work of both kinds of vessels is found.

If the vessels composing the growth contain lymph, the tumor is known as a lymphangioma. Congenital blemishes known as nævi or mother's mark are one form of angioma, quite commonly met with and vary markedly in the extent of skin surface covered by the morbid process.

The chief characteristic features of this form of tumor, are the dilated condition of the superficial blood-vessels and the discoloration, red or purplish red color of the parts involved.

When the blood-spaces are larger and communicate freely the growth is known as a cavernous angioma, and often attains

considerable size.   A feature of this form of the growth, is the marked pulsation generally noted in the erectile mass.

The face, neck, and upper part of the chest are common sites for the appearance of "mother's mark," while the cavernous variety usually is found located in the liver and other glandular organs.

It is only by the character of its contents that a lymphangiomata may be differentiated from other forms of vascular growths, as their other features are very similar as to size, appearance and sense of touch.   Outside of the unsightly appearance of these vascular growths, there are no symptoms of note.

The treatment of small "birth marks" whether merely purplish red patches on the skin surface, or small growths of erectile tissue, should include puncture with the cautery needle or with a large saddler's needle, heated to a red heat in an alcohol flame.

If the erectile tumor is the size of a small egg, it should be tied in quarters with a stout ligature, sufficiently tight to control the circulation, when the growth will shrink and slough away.   Other cases may be of such a nature that excision or amputation may be feasible and resorted to.

PAPILLOMATA

Papillomata are small growths having their origin in the mucous membrane or cutaneous surfaces of the body.   They are made up of hypertrophied papillæ largely of the nature of the tissue from which they spring.

These growths vary in size and number, and are soft or hard, according to their location.   Warts and corns are of this form of tumors and are usually quite dense, while the papillomatous growths appearing on the mucous membrane of the larynx, pharynx, bladder and the vagina are very soft and vascular.

Papillomata are innocent tumors as a rule, but may become malignant, when subjected to irritation for any length of time. Epitheliomata have often had their starting-point in a papilloma, which had been constantly irritated by pressure or chafing.

Symptoms are often wanting in the development of papil-

lomatous growths, the exceptions being the location of the tumor or tumors near small articulations, and in the nose and larynx, when the function of these parts is likely to be in a measure, interfered with.

Treatment: The treatment of this form of growths is their early removal if they can be reached, by the application of some one of these active caustics, the electric cautery, the silk ligature or by excision. Of the active caustic solutions, none are more potent than are glacial acetate, phenic, and nitric acid. Nitrate of silver is also often employed for its topical effect upon the growth, with the result that it soon causes atrophy and the small mass can within a short time, be removed.

ADENOMA

Adenomata are morbid growths composed of glandular tissue, and are of the epithelial type. In certain portions of the body, especially the genital tract, these growths take on a cystic formation, which often develops to a considerable size.   .

A distinguishing feature of this form of tumor is its disposition to remain within certain limits, with no tendency to metastasis or infiltration of adjacent tissue. The character of the structure of the various forms of these glandular tumors vary according to the nature of the tissue from which they spring; those originating from the testicle and ovaries being composed largely of cyst-spaces and columnar or stratified epithelium, while others, springing from mucous and cutaneous glands, are usually vascular and composed largely of a network of connective tissue.

The symptoms accompanying the development of adenomata will vary in accordance to the size of the growths, and their location. There is considerable soreness and distress attending their development in the skin and the mucous membranes of the small canals of the body, such as the fallopian tubes, ureters, the auditory canal and nasal cavity; while those developing in the structure of the kidneys, thyroid, parotid and prostate gland are frequently accompanied by more or less pain, due largely to pressure.

Treatment. The treatment of adenomata will vary according to the location and size of the growths. Those found in the

skin, and such portions of the mucous membrane that can be reached, should be excised or curetted away; while those developing in the uterus, kidneys, prostate and other glandular organs, should either be removed with the curette or cut around and enucleated with a scoop or the finger. Where one kidney is seriously involved, or the testicles or ovaries are found in an advanced state of cystic degeneration, the entire removal of the organ is justified.

Enucleation of glandular growths from the liver or spleen is often followed by more or less hemorrhage, which should be controlled by packing the wound in the organ with tampons of sterile gauze, the end of which should extend through the upper extremity of the abdominal incision, through which the packing is later removed.

To insure success in these operative procedures, every antiseptic precaution should be observed during and after the removal of the growth.

CANCER

Cancer and carcinoma are synonymous terms signifying a tumorous growth, which is malignant in character, with constitutional symptoms manifested by debility, sallow complexion, and a marked anæmic state of the system. The local symptoms are a circumscribed hardness; the growth is usually nodulated in form; the mass is tender to the touch, as well as the lymphatic glands located near the morbid growth; there is an engorgement of the veins in and near the growth, which, with the accompanying sharp twinging pain shooting through the affected region, is usually sufficient to declare the morbid mass malignant in character. Later along in the course of the disease the adjacent tissue becomes infiltrated with abnormal fluids, which render the conditions favorable for the extension of the cancerous mass. The destructive fluid, or agency, of a well developed cancer is so virulent that the toughest and hardest tissue of the system gives way to its devitalizing power.

The fatality of cancer depends largely upon what part of the system the devitalizing disease manifests itself, and the physical state of the body to resist the invasion of the morbid action. If the primary seat of the disease be in the breast or

ovary, and the character of the affection be determined early, and the diseased organ removed before the lymphatic glands in the immediate vicinity become seriously involved, the life of the patient may be indefinitely prolonged; while the disease may speedily terminate life when it attacks vital organs, as the larynx, pylorus, kidneys and liver, when obstruction of important vessels and canals often results, or the destruction of blood vessels, causing fatal hemorrhage. The disease usually destroys life through the loss of appetite, digestive disturbances, and a wrong in blood-making—a morbid state incident to fatal anæmia.

The invasion of the general system by the germs of carcinoma is first through the medium of the lymphatic circulatory system, and later through the veins, which readily convey the poison to the vital organs of the body, especially the liver and lungs, and not infrequently the spleen and kidneys. The morbid phases of the disease are rarely observed in two separate parts of the body at the same time; however, the uterus and ovary have been known to suffer from secondary deposits at about the same period, as well as both mammary glands. This is supposed to result from the intimate relationship, or sympathetic intimacy, existing between the organs involved.

The mammary glands of the female are, perhaps, the most frequently attacked by cancer, the cervix uteri being next in order, while the rectum, pylorus, liver and parotid gland will come next, in the order named. The disease frequently manifests itself at the point of some past injury which has left a mass of indurated tissue, or a cicatrix involving injured nerve filaments, which remain the seat of continuous irritation. People of all classes and conditions of life, regardless of vocation, are subject to the devitalizing disease, its career proving rapidly destructive in the aged, and those feebly inclined.

So fearful of cancerous growths are some people that every lump or nodule discovered on the surface of the body excites the mind to a suspicion that the morbid state may be one of malignancy, and rash measures are frequently resorted to for the removal of the suspicious growth, without first subjecting a section of the same to a careful microscopical examination.

which presents the only reliable diagnostic proof of the character of the growth, whether it be benign or malignant.

Cancerous growths are classified according to the character of the morbid mass into scirrhus, which signifies hardness; melanotic, or black cancer; colloid cancer, in which the morbid mass resembles glue or a jelly-like mass; epithelioma, when the mass is largely composed of epithelial cells, and medullary or soft cancer.

The scirrhus form of the disease is perhaps the most frequently met with; the common sites for its attacks being the rectum, uterus, and the parotid gland, and the mammary gland of the female. Its characteristic features are its firmness, and the tendency to pucker or condense the infiltrated tissue into an unyielding mass. Inflammation is not an early symptom of the aggravated state, nor is the pain and tenderness so keen as to excite apprehension on the part of the patient as to the real character of the affection. Later along these symptoms become alarmingly severe, and if the growth is situated where the patient can medicate it, lotions and anodyne mixtures are topically applied, with hopes that the activity of the disease may be allayed.

The soft, or medullary cancer differs from the scirrhus form in two marked characteristics: Its structure is soft, spongy, and brain-like in appearance, and its career is rapid and actively exhausting. It is not so prone to attack the superficial parts of the organism as scirrhus; but the deeper organic structures, as the liver, spleen, and kidneys, are usually the seat of the primary attack. While adults frequently suffer from this form of cancer, it is the one form of malignant growth incident to early childhood.

There is no special feature in colloid cancer other than the accumulation of jelly-like substance throughout the morbid mass to distinguish it from the medullary or soft variety of the disease.

The epithelial cancer is the least virulent of malignant growths, and develops primarily on the mucous or cutaneous surfaces. Its distinguishing features are its tendency to attack persons in the latter stages of life, its proneness to spring from an irritating wound and small excrescences, as pimples, warts,

and polypi, and the cellular structure of the mass, composed as it is of epithelial cells.

Treatment: The treatment of cancer requires recourse to both local and constitutional measures. If the disease manifests itself in the mammary gland, uterus, kidney, or upon any part of the system that can be sacrificed without grave danger to life, that part or organ should be removed by operative measures as soon as possible after the nature of the morbid state has been determined by physical and microscopical examinations. Not only should the morbid growth be excised, but the lymphatic glands situated in the surrounding tissue should be generously dissected out. In cases of long standing, where the adjacent lymphatic glands are seriously implicated, and the surrounding tissue is infiltrated with poisonous fluids, and marked cachexia is plainly in evidence, manifesting without a doubt the dissemination of the cancerous state through the system, little or no benefit can come from operative measures, and it is frequently observed that such a course speeds on the devitalizing process instead of staying it.

There are many vaunted escharotic agents and mixtures highly extolled for topical application for devitalizing the morbid growth, but aside from the possibility of disintegrating and sloughing out the cancerous mass, thereby temporarily staying the progress of the growth, no benefit is derived from their use. The following formula calls for a plaster that will not disappoint the hopes of the surgeon, if a devitalizing mixture is desired:

R.
Pulv. Arsenious Acid .... ℥ j
Hydrochloride of Heroin .... ℥ j
Gum Opium .... ℥ iss
Menthol Crystals .... ℥ ss
Cold Cream .... ℥ iss

M. Sig.—Spread a sufficient amount on a piece of soft leather to cover the mass to be devitalized; let it remain in contact with the growth for two or three hours, when it is removed and later the deadened tissue is sloughed out with a flax-seed or slippery-elm poultice. If the mass is not thoroughly devitalized by the first application of the arsenical plaster, re-apply it after the slough has come away.

Following the application of the devitalizing paste to the open ulcer the following mixture will be found most valuable

as a dressing. It not only stimulates granulations, but it acts as an energizing antiseptic agent, provoking little if any pain and promotes rapid healing. The mixture is made after two formulas, No. 1 and No. 2. Number one is utilized in cases showing feeble vitality, and where the healing process is slow. Number two is more commonly used following the previous use of the arsenical paste:

No. 1:

℞.
    Zinc Chloride .... gr. xx
    Salicylic Acid .... gr. xl
    Resorcin .... gr. xxx
    Biborate of Soda .... gr. xx
    Glycerine .... fl. ℥ i
M. Sig.—Apply to the open sore two or three times a day, last at bed time, and dress with sterile gauze.

No. 2:

℞.
    Salicylic Acid .... gr. xxx
    Resorcin .... gr. xl
    Biborate of Soda .... gr. xxv
    Glycerine .... fl. ℥ i
M. Sig.—Apply as in Number 1.

If number one is used early in malignant ulcerations the arsenical paste is seldom needed, as the zinc mixture holds in check the destructive process and stimulates granulations. The salicylic acid used should be that made from pure wintergreen oil when possible to obtain it

The only rational treatment of cancer of the breast is early amputation, with thorough dissection of the axillary and supra-clavicular lymphatic glands and vessels. The surgeon should not be deceived by trusting any of the many "sure thing" lotions, mixtures and plasters for the cure of true cancer in this region. True it is, the morbid mass may be entirely removed by the devitalizing escharotic; but it is only for a season. If it is true cancer it will return with renewed virulence. If the growth is of long standing it will be necessary to sacrifice the pectoral muscles along with the rest of the morbid tissue. The after treatment consists in removing the drainage medium the second or third day following the operative work, and the wound cleansed with a weak solution of bi-chloride, which

should be repeated every three or four days unless the soiling of the dressings requires it done oftener. All sutures may be removed by the tenth day, and the patient allowed to sit up a part of the day during the second week. If there is a manifestation of a recurrence of the morbid state, the affected area should be removed without delay.

The constitutional treatment should consist of such remedial agents as will increase the appetite, and improve digestion, and through the medium of good rich food there will be produced a healthy blood supply.

Fowler's solution of arsenic in two-drop doses in water after meals, or in combination with a good compound syrup of hypophosphate of lime and soda, makes a peptic and tonic mixture most valuable in cancerous states of the system. Howe's acid solution of iron administered every alternate week will whip up a capricious appetite and enrich the blood. It should be given in three-drop doses in water one hour after meals. Other tonic and alterative remedies will suggest themselves to the surgeon as he encounters the several phases of the disease.

The treatment of carcinoma of the rectum is by excision, and by establishing an artificial anus in inoperable cases. If the cancerous mass is within the fingers' reach, and the conditions are not too complicated, the growth is drawn down and excised, and the end of the bowel brought down when possible and sutured to the anal margin of the skin. When the resection takes place high up, it is usually executed through a posterior incision (Kraske's operation). Here the end of the gut cannot be brought down to be united to the margin of the skin, but it should be brought to and stitched in the upper angle of the Kraske incision, establishing an artificial sacral anus. Following the operative treatment the wound should be packed with iodoform gauze to check excessive oozing of blood, which should be removed in twenty-four hours, and the traumatism freely irrigated with antiseptic washes. The bowels should be kept confined for four or five days by administering small doses of opium, during which time the patient should be limited to a liquid diet.

Cancer of the uterus is one of the common diseases of women, and is most frequently met with during the latter part

of the child-bearing period. That it is a disease incident to child bearing it is only necessary to note the fact that over ninety per cent of uterine cancer occurs in women that have borne one or more children; while the observance of the morbid state in the nulliparous woman is the exception.

The disease manifests itself either on some part of the cervix or on the body of the organ. The morbid phases of the disease are about the same as are those observed when the affection attacks the soft structures in other parts of the system, viz.: Congestion, induration and infiltration of the adjacent parts; later, lymphatic involvement, pain, and necrotic dissolution of the morbid mass, complicated with functional derangements of the genital and urinary organs. The uterus is more or less enlarged, there is usually present a very fetid watery discharge from the vagina, and active hemorrhages from the uterus are not uncommon.

Operative measures only can give any promise of a cure in carcinoma of the uterus, and even this procedure must be executed early in the course of the disease, while it is limited to the uterus and its immediate vicinity. Otherwise only palliative treatment should be adopted, especially after the patient presents a cachectic and emaciated state of the system. A well regulated diet, and a stimulating and tonic course of medication, will sustain the patient and thwart in a measure the ravages of the devitalizing disease. Outside of these measures little hope can be held out to even stay the progress of the morbid condition.

The ovaries should be sacrificed at the time the uterus is removed, on account of the liability of metastasis of the morbid state to these vascular and susceptible organs.

Carcinoma of the stomach is not a rare affection, and may partake of the character of any one of the several forms of the disease. Persons of middle age seem to be most liable to attacks of gastric cancer, although the disease has been known to appear in a child thirteen years of age.

The scirrhus form of cancer is most frequently met with, and the pylorus is usually the part of the organ for the morbid condition to manifest itself, although the cardiac end of the stomach is frequently the primary seat of the disease. Cicatri-

cial stenosis, the result of ulceration of the pyloric mucosa, is the only morbid state which is likely to be mistaken for gastric cancer.

The diagnostic symptoms of gastric cancer are tenderness on pressure, continuous pain, vomiting, which usually comes on two or three hours after eating, and the character of the matter thrown off, which is usually tough mucus mixed with partly digested food, and at other times the fluid has the appearance of coffee grounds, which condition is due to blood mixed with the ingesta. These symptoms associated with cachexia, anæmia, and the presence of a tumefaction in the gastric region, are sufficient to suggest a condition of malignancy. Active hemorrhages resulting from the erosion of important blood vessels frequently complicate the morbid state. With few exceptions carcinomatous affections of the stomach prove fatal within one year from the inception of the disease.

The treatment of gastric cancer is both palliative and operative. Palliative by administering remedies that remove, or hold in check, inflammatory states of the mucosa of the stomach and such remedial agents as will aid digestion, and relieve nausea and vomiting. Salol alternated with milk of magnesia are valued remedies here, as are small doses of bismuth and oxalate of cerium in three grain doses, three or four times a day.

To relieve gastric irritation and otherwise render the worried organ the better suited for the reception of nourishing food, lavage should be resorted to once daily in aggravated cases, every two or three days in mild attacks of the disease, using a solution of salicylic acid, 1 to 300 in strength. If an anodyne be required to relieve severe paroxysms of pain, hydrochloride of heroin should be given by mouth, incorporated with a teaspoonful of milk of magnesia, or hypodermically in one-tenth grain doses only as needed. Should the patient wisely determine upon operative measures early in the course of the disease, pylorectomy should be done without delay. The diet should be composed of liquid food and taken in such quantities, and at such periods as best suits the patient. Beef-juice, pigs feet jelly, scraped or finely chopped meats; eggs, soft boiled or beaten up and added to milk and a little whiskey, in the form of egg-nog, and mutton

broth, form a dietary from which the patient can select something nourishing for each meal of the day.

Cancer of the tongue presents one of the most distressing states of all surgical affections. The disease most frequently attacks persons of intemperate habits, its primary point usually being in some traumatism, produced by a sharp snag of a carious tooth, or constant pressure of the roughened stem of a tobacco-pipe. Owing to the extensive glandular structures throughout the tongue and throat, the morbid condition extends rapidly through contiguity; the disease frequently proving fatal in from one to two years. The cancerous state is to be differentiated from syphilitic and tubercular ulceration, and indolent traumatic affections. As lymphatic involvement is common in tubercular, syphilitic, and cancerous states, the true pathological condition can only be ascertained by subjecting a section of the morbid mass to a microscopical examination.

Complete extirpation of the tongue is the only rational treatment that can be held out to the patient with any promise of a cure; and then only when the malignancy of the growth has been determined early in the course of the disease, and before the surrounding glandular structures have become complicated. The removal of the tongue is executed through the mouth, through the side of the face by dividing the inferior maxilla, and the external soft parts by extending an incision from the corner of the mouth downward to the lower border of the jaw-bone, and through a circular incision beneath the inferior maxilla.

The local treatment of cancerous states of the tongue by the application of devitalizing escharotics is useless, as is any other form of topical treatment, unless it be the application of the X-ray, which has many advocates to commend it.

In operative cases the nourishment must be fluid food and given through a stomach-tube or per rectum, for two or three weeks, or until the traumatism has about healed. Enfeebled states of the system will call for iron, arsenic, the hypophosphites and plenty of exercise in the sunshine and fresh air.

The primary point for attack of cancer of the penis is usually on the foreskin, or on the body of the organ, immediately behind the glans. The disease is generally observed in men

past the middle age, a feature of the growth is its frequent re-
semblance to a cauliflower, and the early breaking down of the
morbid mass, giving off an exceedingly foul smelling discharge.
The exciting cause of the disease is traumatism, which may
result from various exposures.

Owing to the liability of the metastatic extension of the
disease to the inguinal lymphatic glands, thereby complicating
the morbid state, early amputation is advised, removing about
one-half of the body of the organ by section with the knife,
leaving sufficient cutaneous covering to overlap the stump
and be united to the severed urethra by catgut sutures,
first constricting the base of the penis with a rubber cord to
render the operation bloodless. The dorsal penis artery will
need a ligature thrown around it, and hemorrhage from the end
of the stump is controlled by pressure and the application of
hot water. The after dressing consists of the application of
sterilized gauze, either plain or medicated, held in place by
strips of adhesive plaster. Fine catgut sutures should be used
to unite the urethra to the margin of the skin flap that no fur-
ther effort will be necessary to remove them. Rest in bed
should be enjoined for a few days, especially should the sever-
ity of the case demand the removal of infected inguinal glands.
Aggravated states of the disease may require the removal of
the entire penis, together with the scrotum and testicles. If the
morbid state is seen early, the surgeon is justified in subjecting
the ulcerative sore to the influence of the ultra-violet ray for a
reasonable time before advising operative measures.

The epithelioma or rodent cancer is commonly met with in
persons after middle life, and in men oftener than women.
There are three varieties of the disease recognized, the super-
ficial, deep, and papillary. This differentiation is not essential,
as the treatment of the morbid states is practically the same.
The disease usually manifests itself on the face, the labia, and
the glans penis. It not infrequently attacks the mouth, vaginal
walls, and cervix uteri. The characteristic features of epithel-
ial cancer is its appearance late in life, the primary point of at-
tack frequently manifesting a wart-like or scaly nodule appearance
sharp lancinating pains; after ulceration has set in, the edges are

found hard and indurated, and the discharge usually scanty and sanguineous.

The treatment of epithelioma is by excision and disintegrating escharotics. In the superficial phases of the disease there are few, if any, escharotic agents equal to butter of antimony, topically applied to the morbid mass every third or fourth day till the cancerous tissue becomes deadened, after which it will slough and come away, or it can be removed by poulticing. The arsenical paste previously mentioned will prove efficient also in this form of the disease, as will salicylic acid made into a paste with glycerine and applied three or four times a day, or until the mass hardens and comes away. A few drops of a ten per cent solution of salicylic acid in boiling water in which a few drops of glycerine has been added, injected into the base of cancerous wart or nodule, will prove efficient in destroying the growth in a few days. Butter of antimony usually comes in ounce bottles with a glass rod ground to fit as a stopper; the agent is applied with the glass rod to the morbid tissue as previously advised, should there be a return of the disease.

Special attention should be given to enfeebled states of the system, by administering such remedies as each individual case will demand, usually arsenic combined with some efficient tonic mixture. like compound syrup of the hypophosphites taken with the meals acts kindly, as does Howe's acid solution of iron, a few drops after eating. The patient must take plenty of exercise in the sunshine and fresh air, and eat freely of nourishing food, keeping in mind the fact that the cancerous state is depressing and debilitating in a marked degree.

HYDATID CYSTS

A cystic degeneration of the abdominal organs of a hydatid nature, if of long standing, presents a pathological condition, the relief of which will tax to the utmost, the skill of those who are surgically experienced along the line of abdominal work.

It will be noted that the term relief is mentioned instead of cure, in speaking of a course of procedure in a case of this kind, also that the ailment is spoken of as being of a surgical

nature, and from surgical procedures only, can even relief be expected.

The terms echinococcus and hydatid are used synonymously to denote the cystic development of the larvæ of a species of small tape worm found in some of the flesh eating animals. The infection of the body results from the ingestion of the tape worm ova, which may be found in poorly cooked foods, or in unfiltered brook or spring water to which these animals may have access. Another fruitful source from which the fatal germs may find their way into the human body, is the frequent and uncleanly habit that some people have of fondling cats and dogs, actually kissing them, and allowing them to feed and lick off the same dishes from which they themselves eat. The wonder is that cases of this disease are not more frequently met with in the human family.

The development of hydatids, after the larval infection, is a slow process, and the systemic disturbance depends upon the seat of the disease and the virulency of the attack. If the cystic growths take place in the liver and in the region of the hepatic vessels, or in the mesentery, obstruction to the circulation follows as a result, often giving rise to pain and distress.

The cysts are usually multilocular, and in substance they partake somewhat of the character of the organ in which they develop. Each cyst has a dense fibrous capsule, which encloses a clear, gelatinous fluid, enveloped in a thick white elastic membrane, the edges of which will, if divided by the scalpel, coil in upon itself.

None of the functional organs are exempt from the larval infection, once the ovum finds a lodgment within the body.

The liver is the organ most frequently the seat of the infection, and the hydatids develop here rapidly and to a very large size. They are often found developing in the spleen, kidneys, lungs, and even in the mesentery of the bowels. In the latter tissue, they usually provoke considerable discomfort and pain.

The developing symptoms of the hydatid disease are often very obscure. The diagnosis must be made principally by exclusion. The history of the case, with special reference to where and how the patient has been living, must be noted. If

the patient reports having much of the time been "camping out," drinking promiscuously of exposed streams or spring water, or eating exposed or uncooked vegetables, in and on which the ova may have been deposited, or fondling continuously cats and dogs, hydatid infection may well be suspected, and plans should be laid for early surgical interference, if we presume to successfully eradicate the trouble.

Hydatid formations are prone to pass off with the urine or feces, in cases of kidney and bowel infection. When found in and near the liver, fluctuating tumefactions will often be present, which will have to be discriminated from accumulation of fluid within the gall-bladder.

Treatment: A tumefaction of a suspected hydatid nature being present, an exploratory incision is made down upon it, after the usual surgical toilet has been made. If possible, bring the tumor mass well into the incision; hold it there by strong silk strands passed through the external fibrous capsule on either side, between which, make an incision of sufficient length, through the fibrous capsule only, to evacuate and turn out the gelatinous fluid and its lining of white, elastic membrane. This last procedure will be aided by the curette. Should it be found impossible to turn out this secreting and germ infected membrane, its internal surface may be thoroughly destroyed by sweeping over it 95 per cent carbolic acid on a cotton applicator. To guard against infecting the abdominal peritoneum from the germ laden fluid, or from the acid caustic, the operative field should be well protected with sterile gauze pads.

Thoroughly cleanse the abdominal cavity of all offending matter, carefully inspect all wounded surfaces and ligatures, to guard against any possible post-operative accidents, after which, close the abdomen with interrupted silk-wormgut ligatures, with or without drainage as the nature of the case will determine.

POLYPI

Polypoid growths, springing from mucous membrane lining cavities are pedunculated in shape, invested with mucous membrane, in some cases very vascular, especially when loca-

ted in the rectum and uterus. When located in the nasal chamber the abnormal growth differs somewhat in color and structure from the morbid growth found elsewhere. Here the polypus resembles a jelly-like mass, very movable, and in many cases not abundantly supplied with blood vessels. The nasal polypus is differentiated from the bony or cartilaginous growths by the immovable state of the latter, and from cancerous growths by the absence of bleeding and pain, and from many malignant formations by the absence of ulceration.

Treatment: In advising a treatment for nasal polypi, no space will be given here for recounting obsolete methods, as a permanent cure can only be brought about by mechanical avulsion, and to accomplish this end the operator will need a pair of scissors fashioned for the purpose, one or two pairs of alligator forceps, and a reliable cold wire snare. The latter is indispensable for the removal of large polypoid growths which nearly or quite fill the nasal chamber, with the pedicle quite hidden from view. By previously injecting the pedicle with a four per cent solution of cocaine, to which is added a few drops of adrenalin chloride solution, the growth can be removed with the snare painlessly and without the loss of blood. If the neoplasms are small, and can be brought into view, they may be cocainized and snipped away with the nasal scissors. After either process the nostril is cleansed with the alkaline solution diluted one-half with warm water, and the parts dried with absorbent cotton pledgets, after which the primary point or stump should be touched with a saturated solution of sulphate of copper on a cotton applicator, which will prevent their recurrence. The caustic may have to be repeated several times before the morbid tissue is destroyed from which the neoplasm sprung.

In manipulating the instruments the operator must be ambidextrous, and exercise both patience and skill, to gain the confidence of patient and friends and to expedite the work.

Post-nasal polypi of large size will have to be removed through the floor of the nasal cavity, by first making an incision in the median line through the soft palate down to the bone. This incision should extend forward to about the middle of the hard palate, from which point bi-lateral incisions should be made, extending to the alveolar processes on either

side. The soft tissues, including the periosteum, are dissected back, the hard palate cut away sufficiently to permit the removal of the tumor mass by avulsion or incision; this accomplished, the traumatic tissues are cleansed, the hemorrhage controlled, the flaps are adjusted, and joined with silk or chromicized catgut sutures. The subsequent treatment consists in spraying the nares and traumatic surfaces with a weak solution of salicylic acid and borax every two or three hours, until the healing process is well under way, after which the antiseptic should be used three times a day.

Fig. 35.—Polypus of the womb. (*Howe.*)

Polypi of the auditory canal are removed with the polypoid scissors, or by avulsion when it is fully determined that the growth does not spring from the tympanum. When it is attached to this membrane it should be removed with a fine wire snare. A polypus attached within the cavity of the middle ear is removed by the same method, through the perforation in the membrana tympani caused by pressure of the neoplasm. To facilitate the work, however, it will be necessary to enlarge the perforation, that the pedicle may be reached

more readily. This procedure is beset with difficulties, as the operator will discover in his first efforts to execute the work, and to succeed in the entire removal of the growth will require patience, skill, and a steady hand to manipulate the instruments. Before commencing the operative work the auditory canal should be rendered aseptic by cleansing it with warm antiseptic solutions, after which it should be wiped dry with pledgets of absorbent cotton, the polypoid growth benumbed with the adrenalin chloride and cocaine solution to lessen pain and prevent hemorrhage. In executing the work the largest sized speculum that the meatus will admit should be utilized, and the best possible light reflected from an electric head-lamp, when the operator can avail himself of this valued instrument. After the removal of the growth the stump should be touched with a saturated solution of sulphate of copper or chromic acid, all hemorrhage having been first subdued by applying the adrenalin chloride to bleeding points. Subsequent treatment merely requires the insufflation of finely powdered boracic acid, with or without a little iodosol added.

Uterine polypi are usually soft growths, springing from the uterine mucosa, and not infrequently follow in the train of endometritis. If the growth originates in the fibrous tissue beneath the mucosa, its structure partakes of that tissue as well as that of the overlying structures, and becomes what is described in surgical literature as fibro-myomatous. Usually uterine neoplasms are pedunculated, and vary in size from a large pea to that of a pullet's egg. Their point of attachment may be at any place within the uterus, from the fundus to the margin of the external os, and, in fact, may spring from any point of the external surface of the uterine cervix as well. Uterine polypi seldom give rise to serious states, other than frequent hemorrhages, which seldom provoke alarming symptoms. Once the nature of the tumorous growth is determined, it should be removed by ligation, when the pedicle can be readily detached, or by avulsion when the point of attachment is well within the uterine cavity, and the pedicle is small. When of large size it should be removed with the cold wire snare, after first dilating the cervix to facilitate the operative work. Should hemorrhage be a troublesome feature following the removal of the

growth, pack the uterine cavity with bichloride gauze for from twelve to twenty-four hours.

Rectal polypi, while frequently mistaken for hemorrhoidal tumors, are often met with in children as well as adults. If they spring from glandular tissue, they are soft; if from the deeper structures, they are very firm and well supplied with blood vessels. These rectal growths vary in size from a pea to that of an egg, and are usually found attached to the mucous structures just within the internal sphincter muscle. The growth is usually of a florid red color, and suspended by a well-defined pedicle. Local symptoms leading up to the suspicion of rectal neoplasms are mucoid discharges, later tinged with blood. Hemorrhage in aggravated cases following defecation may be very active. Pain in this morbid state is seldom a noticeable feature. Hemorrhoidal states in children are so infrequently met with, except as a complication of polypi, that the presence of the neoplasm should be suspected in a child suffering with an attack of hemorrhoids.

The treatment of rectal polypi is by ligation when the tumor is large and within reach, using a silk strand for the constricting medium. The patient should be anæsthetized, placed in the lithotomy position, and have the sphincters well divulsed to facilitate the work. The growth is seized with a small pair of traction forceps, and pulled down, while the ligature is applied around the pedicle at its junction with the mucous membrane. Sever the pedicle about a quarter of an inch from the constricting strand with a pair of scissors. Carefully observe the stump, that no hemorrhage is present, before severing the ends of the ligature. Cleanse the rectum with the alkaline antiseptic, and enjoin rest in bed for three or four days. In most cases where the pedicle is attached so high up in the rectum as to preclude the application of the ligature, remove the growth with the cold wire snare, using the same precautions as were recommended in treating uterine polypoid growths. It might be a timely suggestion to advise transfixing the pedicle with a double ligature when its base is large. This method will lessen the chances for hemorrhage by tying the neck in halves, and prevent the slipping of the ligature. The removal of rectal growths by avulsion is not often resorted to, and the clamp and cautery are obsolete.

PART FIVE

Hemorrhage, Shock and Allied Conditions

HEMORRHAGE

Hemorrhage is the escape of blood from its natural channels and is usually described as capillary, venous, and arterial. The causes of hemorrhage are numerous, but may be brought under one of three heads, viz.—injuries, surgical operations, and the result of disease of the vessels themselves. Capillary hemorrhage is usually characterized by an oozing of blood from raw or bruised surfaces. Venous hemorrhage is dark and if active generally wells up into the open wound until the operative field is entirely obscured. Bleeding from an artery is distinguished from that of a vein, by the blood escaping from the divided vessels in jets synchronously with the contraction of the left ventricle of the heart.

Bleeding from an injured vessel within the tissues or into cavities without an external wound, is called **internal** hemorrhage, and **external** hemorrhage, when the blood escapes through a wound in the overlying soft parts.

Hemorrhage occurring at the time of an accident or operation is termed **primary**, and secondary, when it takes place at any period between the reception of the injury and the healing of the wound. If it occurs a few hours after the trauma has been received, it is spoken of as **recurrent** hemorrhage, and may be active in its nature. When the blood escapes into the tissues, forming a clot, varying in size, it is called a hematoma.

Pulsation may be noted in a tumor of this nature as in growths of other varieties, if it is situated over an artery of any considerable size. Ecchymosis is a bluish discoloration of the skin that generally follows an extravasation of blood

just beneath the skin surface, the small arterioles are the blood vessels principally involved.

Hemorrhage from special organs is given names characteristic of the part affected or the effect it has upon local tissue or the general system; thus hemorrhage from the nose is spoken of as **epistaxis,** which is due to ulceration or congestion of the nasal mucous membrane, or to trauma; hemorrhage from the lungs is known as **hemoptysis,** may be due to trauma or tubercular disease. Hemorrhage into the brain substance, from injury or disease, produces a morbid condition known as **cerebral apoplexy,** this is a serious affection and frequently ends in death.   **Hematemesis** is a term signifying hemorrhage of the stomach, the morbid action usually resulting from injuries or ulceration of the mucous coats of the viscus.   Bleeding from the urinary organs is recognized among medical men as **hematuria** and is due either to disease, injuries, calculi, or surgical operations.

The immediate or ultimate result of hemorrhage depends upon the character of the bleeding and the causes leading up to it. Death may take place within a few minutes from the opening of a large vessel or numerous small ones. If the flow of blood be slow and continues over a considerable period of time, the patient gradually becomes weak, anemic, and gradually lapses into a state of syncope and then into collapse, followed in a short time by death.

If surgical operations could be robbed of the loss of blood, surgeons would feel more bold in their attempts to execute operative procedures, but as Prof. A. Jackson Howe remarks in his Art and Science of Surgery, "The student once initiated into the mysteries of hemorrhage, lays aside unfounded fears, and cultivates a rational precaution against engaging in what the experienced would deem as a display of rashness."

As before recounted, the symptoms following the loss of blood are physical weakness, giddiness, anemia showing in the pale features, dyspnea, and collapse in grave cases. To these may be added other symptoms accompanying internal hemorrhage such as restlessness, thirst, rapid, easily compressed pulse, sighing respiration; anxious expression; pupils dilated; cold, clammy skin; often bathed with perspiration; and not unfrequently a sickening abdominal pain in the region

of the umbilicus. The temperature in advanced cases is nearly always subnormal. It is claimed that death will result under ordinary circumstances, if one half of the amount of blood of the system be lost, and a fatal issue has often followed the loss of a less amount, when accompanied by shock or where the loss has been rapid.

The treatment of hemorrhage will vary according to the exciting cause, the character of the flow of blood, and the immediate requirements in the individual case. A divided artery or vein of any considerable size requires the application of a ligature, if they can be approached; if this is impracticable, the bleeding vessel should be seized with clamp forceps, which should be allowed to remain twenty-four to forty-eight hours. Small arterial twigs severed during operative procedures, may be picked up with artery forceps, twisted and pushed into the surrounding tissues. Bleeding from a penetrating wound may be readily checked by tamponing the cavity with styptic lint or strips of sterile gauze.

Hemorrhage from mangled extremities may be temporarily controlled, by loosely encircling the limb a short distance above the injury with a folded pocket handkerchief, or some substitute, and twisting tightly through the medium of a pencil or a short stick passed through the loop. If a rubber cord be available, it may be used in place of the folded handkerchief; two or three turns of the cord around the limb are sufficient, when the ends are tied or secured with forceps.

Digital compression of the femoral artery upon the pubic bone just below Poupart's ligament, will control bleeding from the main artery and its branches. By compressing the brachial artery against the humerus, loss of blood may be readily controlled at any part of the arm below the point of constriction.

Capillary oozing of blood from the margins of incised wounds may be promptly controlled by approximating the raw surfaces and securing them snugly with catgut sutures. Hemorrhage from capillaries in extensive traumatic surfaces, may also be controlled by the application of heat in the form of sterile pads, wet in hot salt water at a temperature of 118 deg. F. or as hot as it is possible to bear the hand in. Ice held in contact with bleeding surfaces will often prove effective in con-

trolling slight hemorrhages, but should not be preferred to heat, as the latter sears over the raw surfaces, causing a coagulation of albumen, thus coating over and occluding the open capillary vessels.

Unless the flow of blood is very active from the severance of large vessels, it may be controlled by the formation of clots in the mouths of the divided vessels, provided the patient is placed at rest in bed. The blood first forms a clot in the mouth of the open vessel and as the plug enlarges, it extends up into the lumen of the bleeding artery. This is nature's method of checking the flow of blood, and proves effectual in most cases.

Owing to the contractile nature of the coats of an artery the opening of a severed branch contracts immediately, thus lessening the flow of blood, which favors the formation of a clot in the orifice of the vessel. Owing to the collapsibility of the thin walls of the veins, and the low blood pressure within these vessels, venous hemorrhage is more easily controlled than is that from the arteries.

Certain chemical agents, called **styptics,** are efficient in the control of hemorrhage when applied directly in the wound on lint or gauze. Their method of action is to cause the blood to coagulate, thus occluding the mouths of the bleeding vessels. The most potent of these agents are persulphate of iron, tincture of the chloride of iron, tannic acid, powdered alum, and a solution of adrenalin chloride. The latter may be injected into the tissues in and near the bleeding vessels with a hypodermic needle to advantage.

Hemorrhage from the nutrient artery of any one of the large bones, may be controlled by digital pressure over the nutrient foramen for five or ten minutes. If this fails to check the flow of blood, the canal should be plugged with a section of cat-gut or wooden peg, after wetting them in a solution of adrenalin chloride or tincture of the chloride of iron. Bleeding from the traumatic surfaces of bone may be easily checked by pressing a gauze compress against the bleeding surface, after it has been wet with andrenalin solution, or a hot normal saline mixture.

Position has much to do in the controlling of hemorrhage, especially from bleeding vessels in the extremities. Spurting

blood from a wound in the palmar arch may be decidedly checked by elevating the hand above the head; and bleeding from the nose, mouth and open wounds of the head is notably lessened when the patient is kept in the sitting position.

Hemorrhage from special organs is treated of in most works on general practice, but will be noted briefly here in connection with what has been said regarding the treatment of external hemorrhages.

Hemorrhage from the lungs (hemoptysis) is controlled with such remedies as will lessen blood-pressure and favor the clotting of blood in the mouths of the open vessels by constringing the latter. To accomplish these ends certain medicinal agents are administered in proper doses, to meet the needs in the individual case. In this connection such remedies as aconite, veratrum, and lycopus virginicus should be thought of to lessen blood pressure; and ergot, mangifera, gallic acid, chloride of sodium, ipecac, and carbo-veg. in the third trituration, for their effect upon the bleeding vessels. Bits of pounded ice swallowed occasionally have a restraining influence over the escaping blood, as does the inhalation of the vapor of the oil of turpentine. The vapor is generated by placing three or four drachms in a porcelain dish while the latter is floated on boiling water.

During attacks of hemorrhage the patient should be kept at rest in a semi-prone position, in a moderately cool room, and allowed only a small spare diet and cooling drinks.

Cerebral hemorrhage may be controlled or modified by placing the patient at rest in bed, in a cool room, and administering drop doses of spc. tr. veratrum and lycopus every half to one hour if there is evidence of increased vascular tension and elevation of temperature; congestion of the conjunctiva and a flushed face are strong indications of this morbid state. Placing the feet in hot mustard water, or applying mustard plasters to the lower limbs, are valued agencies to direct the blood from the brain. The application of the ice-cap to the head is of benefit in cases such as are above described. Sinapisms to the nape of the neck call the blood away from the cerebral vessels, as does moving the bowels briskly with the saline cathartics. Great physical weakness following cerebral hemorrhage calls for po-

tent nerve stimulants in regulated doses; in this connection the action of strychnia, phosphorus, carbonate of ammonia, and small doses of quinia, should be considered. Pressure upon important nerve centers, caused by clots following hemorrhage from the cerebral vessels, often calls for surgical intervention, especially if the location of the hemorrhagic mass can, with any degree of accuracy, be located. After proper preparation the skull over the area where the clot is suspected to rest is laid bare through an incision in the scalp, trephined in one or more places, and the clot sought for by the aid of a probe or groove director; if found it should be carefully turned out of its bed, the traumatic surfaces cleansed with warm normal saline solution, the buttons of bone which were removed from the skull with the trephine replaced, after which the margins of the scalp are approximated and sutured with catgut, first having provided for drainage if the nature of the case requires it.

The crippling of muscular action provoked by pressure of the clot upon certain nerve centers may be overcome in great measure by massage and the application of galvanism over the course of the nerves supplying the paralyzed muscular structures.

To avoid a recurrence of the hemorrhage the patient should refrain from active exercise and mental excitement following the recovery from hemorrhagic attack.

Sub-cutaneous hemorrhage eventuating in a discoloration of the integument (ecchymosis), requires the local application of stimulating lotions on soft compresses, over which a piece of oiled silk of suitable size should be placed, and over this a small pad of absorbent cotton or cotton-wool is laid, and all snugly bandaged, if the part be situated where this form of dressing is feasible. The following mixture forms a most excellent lotion for the treatment of ecchymosis:

℞.
Tr. Arnica .... ℥ j
Tr. Capsicum .... ℨ iij
Tr. Veratrum .... ℥ ss
Spts. Camphor, q. s. ....fl. ℥ iv
M. Sig.—Apply locally to the discoloration.

Discretion should be exercised regarding the use of this mixture about the eyes. Other remedial agents, such as witch-hazel, lead and opium wash, and alcohol diluted to the required

within the tissues

or hemorrhage from ... the treatment of ... in bed, and ... into the stomach for some ... administered per rectum ... and morphine or heroin should ... in appropriate doses, and in connection ... if not ... condition of the patient. If the ... controlled by some ... Lycopus, ergot ... the two latter being given ...

the influence of medicine ... cause of the morbid ... impacted calculus ... urinary track during ... and belladonna ... doses and in ... quite active, at ... given with benefit ... drachms of the ... every hour ... canadensis in five ... cases, as ... A few drops ... water and intro- ... needle. ... surgeon are ... be given

To check hemorrhage from the urethra, if active, a gum catheter should be inserted and the penis moderately compressed around it by the application of a roller bandage.

SHOCK

Injuries, hemorrhage, and mental impressions, such as grief, joy, and fear, that profoundly impress the nervous system, result in a feeble state of the vital powers that we call shock.

An irregular and feeble pulse, subnormal temperature, face pallid and bathed in perspiration, muscles relaxed, semi-consciousness, with perhaps nausea and vomiting, are symptoms indicating a state of collapse, or shock, which will within a reasonable time, eventuate in reaction, however slow, or death.

Treatment will depend entirely on the exciting cause. If from hemorrhage, ligate the bleeding vessels, or pack the oozing wound when possible, with sterilized gauze. If from compression of the brain, intussusception of the bowel, strangulated hernia, or other ailments of a like nature, operative measures must be resorted to at the outset, subsequently applying heat, either moist or dry, to available parts of the body, especially the spine, feet and legs. The recumbent position should be assumed with the head low. Hot rectal enemas of normal saline solution (a drachm to the pint) or hypodermic injections of strychnia nitrate, one thirtieth grain every half hour, with brandy administered in alternation and in the same way until three doses have been taken of each. Later stimulants may be given by the stomach.

The function of the kidneys following shock, should be noted and any wrong corrected. An occasional hypodermic injection of hydrochloride of heroin, one-twelfth to one-sixth, or one-eighth to one-fourth grain of morphine, is demanded in cases resulting from severe pain.

The diet should consist of fluids, both nourishing and stimulating, taken in small quantities and frequently. Except in emergency cases, a general anæsthetic should not be given during pronounced shock.

DELIRIUM TREMENS

The excessive use of alcoholic stimulants over a long period of time not infrequently produces a train of nervous symptoms often most shocking to observe. A typical case of delirium usually presents a condition of extreme nervousness, loss of sleep, rapid wiry pulse, delusions and hallucinations, muscular tremor, eyes glassy and staring, and digestive disturbances. The individual is illusional; he sees weird objects around and about him and hears sounds that do not exist. He cannot remain quiet, preferring to move about from place to place. These cases grow from bad to worse until heart complications set in, followed by collapse and if not relieved, they frequently terminate in death.

The individual addicted to drink, often takes on flesh, the nutritive action of alcohol being antagonistic to the normal waste of tissue, but the tippling agent, in the course of time, blunts sensibility and renders the mind less active for mental work. While an occasional **nip** of whiskey will whip up flagging vital powers, the agent cannot be reckoned as a food or even a tonic, in the sense that many consider it. Under its continued use, the mucous membranes become irritated and hypertrophied and muscular and nervous tissue hardened.

Persons addicted to drink do not withstand surgical operations well, wounds do not heal quickly and the confinement to bed is extremely irksome.

The individual given to drink, if of a nervous or sanguine temperament is far more apt to become attacked with **mania a potu** than are those of a lymphatic temperament, and trouble and depressed spirits predispose to the frightful disease.

The affection is often quickly ushered in by the sudden withdrawal of all alcoholic beverages, while the appetite is so defective, that sufficient food cannot be taken to stimulate and nourish the nervous system.

Confirmed drunkards, wild with maniacal delirium, seldom recover.

Treatment: The surgeon is especially concerned in the treatment of delirium tremens, when it occurs in individuals suffering injury or are about to undergo operative measures for relief from some abnormal condition of body.

Alcoholic beverages should not be withheld at this time, a sufficient amount being allowed consistent with the patient's condition and the nature of the operation to be executed. In connection with the alcohol administered, the patient should be allowed to partake freely of hot beef soup, beef tea, hot milk, corn-meal gruel, egg-nog and coffee.

Sleep is induced by potent doses of bromide of soda, chloral hydrate in lemon or orange syrup, codeine, heroin and morphine; the latter seems to act kindly, when given in combination with cactus and hyoscyamus (Abbott's tablet). Given hypodermically it acts promptly and outside of the medicine, drying the mouth and throat, no unpleasant after effects have been observed. However, the effect of any hypnotic agent, potent enough to produce sleep in delirium tremens, should be carefully watched, especially the opiates, as the large doses required to give rest and sleep in the worst phases of the disease, often do great harm to the patient.

Specific digitalis alternated with large doses of passiflora acts kindly in cases where the patient is sleepless and restless, with developing cardiac weakness, if the stomach is in a condition to absorb the mixtures. The infusion of digitalis given in small teaspoonful doses, often gives more prompt results than does the tincture, besides its diuretic effect is generally required in most cases.

The bowels, if bound, should be moved with citrate of magnesia and if too loose, as they often are in cases of marked digestive disturbance, the following powder mixture will prove of great benefit:

℞.
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Bismuth Sub. Nit. .............................. ℥ ij
Ginger ........................................ gr. xx
Pepsin Powd ................................... ℥ j
Carbo. Veg. ................................... ℥ ss
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M. Sig.—Make Powders No. thirty. One every three or four hours.

FAT—EMBOLISM

Following soon after fractured injuries of the bones, a morbid condition of the pulmonary circulation develops in some cases, which is due to the plugging of the capillary vessels with

globules of fat, coming from the bone marrow or from fatty tissue suffering laceration at the time of the fracture.

Other organs of the system are found to contain more or less fat globules in marked cases of the morbid state, especially the kidneys and liver and in order for the particles of fat to reach the stroma of these organs, they must pass through the lungs in the circulating fluid, they finding their entrance into the latter through the lymphatic system of vessels.

The morbid condition generally becomes manifest through the disturbances caused to the nervous and respiratory system. Dyspnea is an early symptom, as is restlessness and loss of sleep. The patient usually presents a worried countenance and complains often of headache soon after the onset of the ailment. Irregular heart action may be noted in pronounced cases.

The patient, to make satisfactory recovery, should be kept in bed on rather a stimulating diet, composed mostly of rich soups and broths, eschewing liquors in all forms.

A weak heart will call for specific cactus, digitalis, and cratægus in small but frequent doses. Nitroglycerin should be administered in two or three drop doses, if the heart disturbance amounts to a cyanotic state; other complications should be met with such remedies as are indicated in the presenting case.

URÆMIA

The retention in the system of urinary matters that should have been secreted by the kidneys, gives rise to a morbid state of the body known as uræmia. The presence in the blood of a considerable amount of the noxious matter often seriously impresses the vital powers and not infrequently terminates in death. The effect of the poison on the individual will depend in great measure, upon the amount of resisting power with which he is endowed; if the accumulation be due to suppression of urine from some general disease, the effect of the toxemia will be gradual but persistent; should the morbid condition result from trauma or obstruction of the ureters, the noxious effect upon the system is at once pronounced and a fatal termination may be expected unless relieved by operative measures.

The causes of uræmia are septic disease, trauma, obstruction of the ureters, and the embarrassment of the renal function from the continued use of chloroform or ether over a considerable period of time in diseased states of the kidneys.

The usual symptoms presenting in uræmic toxemia are headache, lassitude, vertigo, scanty urine, rapid wiry pulse, tongue dry and usually furred, breath foul, temperature increased, stupor, muscular twitchings, mental confusion, respiration irregular, impairment of vision, dyspnea, coma, and not infrequently convulsions.

Treatment: To accomplish much in the treatment of uræmia by medical and surgical methods, the morbid condition and the cause leading up to it should be determined early. Of the first importance is the establishment of a free secretion of urine, which is generally accomplished by the administration of specific apis, gelsemium, and cantharides; or instead of these agents, give liberal doses of an infusion of apocynum or digitalis; the latter is to be preferred in severe cases, showing edema with a weak heart action. The citrate or acetate of potash, given in ten to twenty grain doses in a half glass of water every two or three hours will accomplish much good, especially if taken in connection with the digitalis infusion.

The bowels should be kept open with the compound powder of jalap and senna or bitartrate of potash, one-fourth grain doses of elaterium, and croton oil in drop doses in gruel; and free diaphoresis maintained in severe cases by the administration of hot infusions of eupatorium, or asclepias tuberosa; or in lieu of these agents, give small doses of jaborandi or pilocarpine in connection with hot air or vapor baths in persons of vigorous constitution, if not otherwise contraindicated by weak heart's action. Dry cupping, followed by hot wet packs to the loins will prove efficient ofttimes in exciting the kidneys to increased action.

To ascertain whether or not urine is secreted in any amount, a catheter should be introduced occasionally, if the patient is unable to void urine naturally.

In extreme cases of uræmia, a resort to intravenous infusions and flushings with hot saline solution, is followed with

prompt indications of renewed vitality and increased secretion of urine.

Uræmia in a marked degree, occurring during the latter months of pregnancy, will justify a tremination of the puerperal state by induced delivery of the fetus.

Following an attack of uræmia, the patient should be placed on a stimulating and nourishing diet, of which milk should compose the principal part. Koumiss and rich broths may be allowed and are generally taken with a relish.

HEMOPHILIA—"BLEEDERS"

With many persons there is a strong tendency to passive hemorrhage, following any little traumatism that may be inflicted upon them. It is said that this class of persons has a hemorrhagic diathesis. It is also claimed by pathologists that the morbid state is markedly influenced by hereditary peculiarities acquired principally from the female ancestry.

Men are far more liable to the disease than women, but the early phase of the hemorrhagic state does not become manifest until about the age of twenty; exceptional cases a few years younger.

Persons afflicted with the abnormal state are apt to have other complications of greater or less severity. Swelling of the joints, especially the ankle, knee and elbow, is frequently observed as well as hemorrhagic tumefactions of various sizes, found in the regions formed of areolar tissue. Grave anæmic conditions usually follow weeks of capillary hemorrhages of this nature.

Treatment: Owing to the fact that these "bleeders" are generally observed to be of a strumous diathesis, it naturally follows that the treatment to be effectual, must be of an alterative and supportive nature. To invigorate the vital powers, two drop doses of Fowler's solution of arsenic taken in water after meals will prove of benefit, as will three drop doses of Howe's acid solution of iron taken in water every three hours during the day. As hemostatic agents, chloride of calcium, adrenalin chloride, oil of erigeron, and specific tr. of ergot, combined with

witch-hazel in the proportion of two drachms of the former to three drachms of the latter, added to four ounces of water, a teaspoonful every two hours are alternated with any one of the other efficient remedies mentioned. The dose of calcium chloride is two to three grains in water every two hours. Adrenalin chloride is administered in three to five drop doses every three hours while a necessity exists for its use.

INTRAMEDULLARY HEMORRHAGE.

This morbid condition is due to accidental causes and occurs most frequently in the cervical region. Falling from a height and striking upon the head or diving in shallow water, striking the head on the bottom of the tank or stream, are common causes of the injury. It may occur with or without fracture of the vertebra.

The hemorrhage is generally observed in the anterior horn of the gray matter, but may occur in the posterior horn at the same time, also the body of the cord; not infrequently there is extravasation of blood for some little distance from the initial point of hemorrhage, markedly changing the color and consistency of the nervous tissue thus involved.

Paralysis is a characteristic symptom of the condition and varies in degree of severity in proportion to the extent of the hemorrhage that has taken place in the tissue. If the loss of sensibility be complete, the functions of the bladder and bowels are often markedly crippled and ulcers not infrequently appear upon the surface of the body wherever pressure has existed for any length of time.

Complete recovery from anything like a severe hemorrhage seldom takes place, although a partial recovery of the function of crippled organs frequently follows the effect of ruptured blood vessels.

Treatment: The treatment consists in most part in keeping the patient quiet in bed, the mattress of which should have a hair top and the covers should be light. The bed-room should be light and airy and free from noise. To avoid bedsores, the hips and other exposed parts should be occasionally bathed

with alcohol and water, equal parts, and dusted with oxide of zinc. The bowels should be moved with enemas of warm salt water or glycerine and warm water; the latter will provoke quite active peristaltic action, which is very necessary in partial paralysis of the rectum. Cystitis may be prevented by administering internally small doses of sulph. of magnesia on alternate days, and occasionally washing out the viscus with a dilute solution of the alkaline mixture.

The patient's strength should be maintained by giving small doses of nitrate of strychnia, phosphide of zinc, dilute phosphoric acid or other potent remedial agents that seem to be indicated.

CEREBRAL HEMORRHAGE—APOPLEXY

Hemorrhage into the cerebral substance may follow operations on the brain, fractures of the skull, and diseases of the blood-vessels. When due to the latter cause, the morbid state is usually spoken of as cerebral apoplexy, although the symptoms accompanying hemorrhage into the brain, from whatever cause, do not differ in their main features, and the treatment in all cases is about the same.

The character of the symptoms will depend, of course, upon the amount of blood extravasated into the brain tissue or beneath the meninges of the brain, and the location of the hemorrhagic area. The usual symptoms immediately following the hemorrhage are vertigo, shock, unconsciousness, more or less pronounced; headache, ringing in the ears, vomiting, pupils irregular, temperature generally subnormal, face may be flushed and respirations slow and stertorous; pulse is generally full and slow, and as the clot increases, paralysis of certain groups of muscles generally becomes manifest. In these cases, the tongue, when protruding, usually deviates to the paralyzed side and the functions of the bowels and bladder to some extent, are crippled.

The hemorrhage does not always come from arteries, but very often occurs from ruptured veins and opened sinuses, resulting from penetrating wounds and compound fractures of the

skull. In these cases, the flow of blood is moderately slow and may be controlled by pressure or plugging.

Cerebral hemorrhage not infrequently occurs in babies, as a result of difficult birth, where forceps are called into use to facilitate the labor. A certain degree of paralysis often follows these injuries, which is known as "birth palsy." This affection may cripple an arm and leg and certain other groups of muscles, perhaps of the face or neck, and yet the patient may survive the morbid condition for years, in fact, he may reach old age, while on the other hand, marked cases may terminate in convulsions and death within a short time following the injury.

Treatment: The treatment of cerebral hemorrhage will be by ligation of the common carotid artery, when any of its cerebral branches suffer rupture, or opening the skull by trephining, seeking the bleeding vein or sinus and carefully plugging the same with bits of iodoform or sterile gauze, which should be left in place forty-eight hours or longer if the nature of the case demands it.

Clots forming from cortical hemorrhage in new-born infants are very apt to prove rapidly fatal, unless the skull is opened and the pressure medium is turned out. The operation is feasible and should be done under strict aseptic measures. Following the operation, the patient should be kept as quiet as possible and given such nourishment as the case demands.

WOUNDS

A recent injury to the soft parts of the body, either internally or externally, the result of a blow, kick, fall, stab, bite, or gunshot, may rightfully be termed a wound.

For descriptive convenience wounds have been divided according to their nature and the character of infliction. Thus we have the lacerated, contused, incised, punctured, penetrating and gunshot.

Treatment has for its object the arrest of hemorrhage, cleansing of the parts affected; the uniting of the separated surfaces with sutures, adhesive strips, or bandages, and keeping the wound aseptic to prevent infection.

Lacerated wounds are such as are produced with machinery when in motion, or by coming in contact with rough surfaces of hard substances.

After cleansing the part with some antiseptic solution, control all bleeding points, adjust and suture opposing surfaces, first trimming away with scissors any shreds of skin and flesh that may exist. If parts are extensively torn, the use of adhesive strips or compresses will have to be made use of. Then place the part in a restful position and apply cloths wet in the alkaline solution.

Incised wounds are made by cutting instruments and usually bleed more freely than the contused, as the blood-vessels are keenly severed without much bruising.

The same line of treatment is to be adopted with this class of wounds as with the contused. Better results are generally obtained, as union without suppuration is the rule when proper antiseptic measures are observed. Here as well as in the treatment of all aseptic injuries, redressings should be limited to the severity of the case, as exposure to the air and frequent handling endangers the wound to infection.

More serious results follow the punctured wound than either of the others mentioned, caused in the main by the poisonous state of the implement inflicting the injury. Should the instrument making the injury be aseptic, no serious lesions are likely to follow except it be the accidental wounding of important nerves and blood vessels.

The gravity of a penetrating wound depends on its depth, location, and the character of the instrument inflicting it; should it be very blunt, foreign matter is likely to be introduced at the time of the injury, and much extravasation of blood follow, which, if not given vent by incision and proper drainage, is prone to putrefactive changes, eventuating in a septicemic state of body, attended with rigors, fever, thirst, headache and functional wrongs of greater or less degree. This morbid state is likely to follow deep punctured wounds of the palms of the hands, or soles of the feet; here the textures are firm and extensively supplied with nerves; putrefactive changes taking place here is prone to cause constitutional disturbances likely to end in tetanus.

Treatment: Treatment of penetrating wounds when superficial, consists of the application of soothing agents to control pain and subdue any inflammatory action that may be present. Cloths wrung out of hot biborate of sodium solution, frequently applied are usually efficient when severe pain is a feature.

Sometimes heat increases the pain, in this case the solution should be used cold. In simple cases all symptoms of injury will subside in three or four days, no other treatment being called for.

Wounds of deep penetration, developing symptoms of local and systemic disturbances will need opening up by deep incision and drainage at the outset with subsequent dressings with the soda solution above referred to, to one-half ounce of soda to the half gallon of water is the usual strength, to which can be added one drachm of salicylic acid (the latter being first dissolved in boiling water), should the injured part show a disposition to slough.

Constitutional symptoms must receive attention; anodynes are indicated, used hypodermically if pain is severe, the hydrochloride of heroin being preferred to morphine, used in one-twelfth to one-sixth grain doses.

Septicemic states will call for echinacea or baptisia in potent doses, or if the tongue shows deep red with a lack of secretion, give dilute muriatic acid, five drops in a little sweetened water every three hours.

The diet should be nutritious, eggs, beef, and milk, in their various methods of preparation, with rich lemonade as a drink may be permitted.

The further treatment of tetanic conditions will be given under the subject of tetanus.

The contused or bruised wound is such as is received from blows, kicks, and forces of a like nature. The injury may be superficial, with merely an abrasion of the skin with slight redness and swelling of the part, or the deeper structures may suffer injury to the extent that blood-vessels are ruptured, extravasation of fluids taking place, which sooner or later finds its way to the surface, discoloring the part to a greater or less degree. Suppuration may result from the formation and disorganization of a blood clot, which occasionally forms after the injury.

The extravasation of blood around the eye, following a blow inflicted to that region, termed "black eye," is of the contused variety of injury, and is of such common occurrence, and is of so objectionable an appearance, that it demands prompt and efficient treatment for its removal. Cracked ice inclosed in a soft compress, wet in a solution of hamamelis and water, two parts of the former to four parts of the latter, and pressed against the part is serviceable, also the following painted over the part immediately after the injury.

℞.
   Infusion of Capsicum ....
   Mucilage of Gum Arabic, āā .... ℥ i
   Glycerine .... ℥ ii

M. Sig.—Three applications should be made, following each other every two or three hours.

The treatment alluded to above for bruises about the eye is efficient for like injuries to other parts. Where it can be conveniently applied, Lloyd's libradol will be found both serviceable and convenient; especially will it be valuable in marked inflammatory and painful states. Should the local injury eventuate in an abscess, incise and establish drainage, and use freely of antiseptic fluids with frequent dressings.

Injuries produced by flying missiles, propelled by the explosion of gun-powder, is termed a gun-shot wound, and its severity depends upon the character of the projectile, as to size, shape, and density. Objects of large size, hurled with great force prove rapidly fatal, while those of irregular shape, cut ragged, gaping tracks through the soft parts; the soft leaden bullet flattens when striking the structures of the body, tearing its way through it. This distinction is of little consequence to the surgeon in following out a course of treatment, as the result of each, if entering the deep structures of the body, is devitalizing and demands a like course to sustain the vital power.

There is more or less shock following gun-shot injuries, especially so if the abdominal organs suffer injury at the same time; to overcome this and to place the patient in a position for any surgical interference, he should be placed in comfortable quarters, clothing removed, hemorrhage controlled, brandy or strychnia used hypodermically, but cautiously. Severe pain will

call for anodynes, which, on account of nausea, delaying speedy absorption, should be given hypodermically.

Probing for bullets should be resorted to when the suspected missiles are embedded in structures other than the abdominal viscera and lungs, and in the absence of a wound of exit. Abdominal incision is invariably indicated where wounds of entrance lead to that cavity; the patient presenting a pale face, rapid pulse, and extreme restlessness, all symptoms of internal injuries, attended, perhaps, with hemorrhage. Bullet wounds in the palms of the hands, or in the soles of the feet need to be well opened up and freely cleansed with antiseptic washes. Leaden bullets free from poison, aseptic, often become encysted, giving but little after trouble. Should the wound take on gangrenous symptoms, indicating injury to important nerves and blood vessels, in the arms or legs, amputation may have to be resorted to early to save life.

Wounds inflicted by poisonous reptiles, as snakes, spiders, and the Gila monster are common in hot climates infested with these pests. After the sting has been inflicted, the part soon becomes swollen and mottled in color, proving the rapid decomposition of blood, the victim becomes dizzy, weak and nauseated, and soon becomes bathed in cold perspiration.

There are several vaunted remedies highly praised for the cure of "snake" bite in every section of country where these reptiles are found. The treatment that has given the best results is as follows: As soon as possible after the sting has been received, inject in and around the point of infection about one drachm of a two per cent solution of permanganate of potash, care should be taken that a portion of the antidotal agent is deposited deep beneath the bite. Following this and as quickly as possible, throw a ligature around the limb, above the bite, removing the restricting strand higher up as the swelling extends, the object being to retard the absorption of the poison as long as possible, giving the antidote a reasonable time to neutralize it. Small potions of whiskey should be given every half to one hour to stimulate the vital powers, avoiding profound intoxication. Not much dependence can be put in cauterizing the wound, for seldom does the escharotic dip down deep enough to attack the rapidly spreading virus. Should the infection

result in sloughing of the part, it must be treated as other wounds of a like nature. The frequent application of some potent antiseptic, keeping the general system well stimulated with tonics and peptics should be the after treatment.

Dissecting wounds produced by the inoculation of infective micro-organisms, develop, within a few hours, vesicles, inflammation, and glandular enlargement, attended with an itching and a burning pain.

Treatment consists in keeping the bowels open with saline laxatives, controlling pain with the local application of equal parts of camphor and chloral. In connection give ten drop doses of echafolta in water every two hours, alternated with one teaspoonful of effervescent salicylate of lithium in a half glass of water, or free draughts of good, rich lemonade, with a stimulating diet, and an occasional dose of chloral to control excessive pain.

HEMATOCELE

Hematocele is a term usually given to an effusion of blood into the tunic, or covering of the testicle. The name signifies other wrongs, however, for the same term is given to collections of blood in the pelvis, and other cavities of the body. To all appearances there is little difference between a hematocele and hydrocele, except the former imparts a darker color, and the usual tests for hydrocele determine the presence of blood, or blood and serum mixed together as is found in hydrocele complicated with a traumatism.

In recent cases the patient should keep his bed, the scrotum should be elevated, cold applications applied over which a bandage should be run on. If favorable results are not obtained in a few days, open the cystic tumor, evacuate the fluid and clots, if such should be present, and apply the after treatment recommended in hydrocele.

HEMATOMA

Hematomata are blood tumors formed in the tissues. They are the result of trauma, and are often observed in con-

nection with fractures and contusions. Hematoma auris is a collection of bloody serum between the cartilage and the perichondrium. It is an effusion of sanguineous fluid, and is observed mostly in the insane, and is, in most cases, due to a bruising of the tissues.

The result of the escape of blood into the tissues varies. In most cases it forms a clot, which may, in time, be observed, the tough surrounding membranous tissue remaining, but causing little disturbance in the adjacent parts. The clot may, however, become infected, and break down into a purulent fluid. When this takes place in connection with a fracture or wound it often seriously complicates the injury, delaying union for an indefinite time. When the morbid action takes place about the ear, the surrounding parts become thickened, which time fails to entirely reduce.

The symptoms at the outset are tenderness and acute pain on pressure, due to the local inflammatory action that the tumor causes. These symptoms subside, however, as the little tumor becomes surrounded with a dense membrane, more or less fibrous in nature. If the clot breaks down and an abscess forms, there will be experienced a local inflammatory action, with throbbing.

Treatment: If surgical interference is demanded, it will consist of incising the overlying tissue, permitting the purulent fluid to escape. The cavity should then be cleaned out with peroxide of hydrogen, and dressed antiseptically. To open the tumor early the clot may be turned out, thus avoiding the possibility of an abscess forming.

PART SIX

Surgical Technic

CATHETERISM AND THE PASSAGE OF SOUNDS

The object in introducing a catheter into the bladder is to evacuate the urine of the viscus, when it cannot be voided naturally; also for the purpose of irrigation in cases of chronic cystitis.

Ordinarily the instrument can be introduced without much trouble, if it is correctly fashioned and properly manipulated. To meet the requirements of the various morbid conditions of the urethra, a variety of catheters should be at the command of the surgeon. In the absence of pronounced strictures, the ordinary metallic catheter, if properly curved, will meet all requirements in the majority of cases.

A catheter, to be introduced easily, should not be so small that it is likely to engage in folds of mucous membrane and be thrust through the urinary duct, nor so large that its use inflicts unnecessary pain.

Catheters are made of soft rubber, gum-elastic, silk, metal and glass, and vary in size from No. 1 to 23, American scale; No. 2 to 35, French scale. The beak or entering end of the elastic catheters is made pointed, olive-pointed, conical, single and double-elbowed, with a view of meeting the requirements in the abnormal conditions that are often found to exist in the urethra. The instrument should be sterilized and lubricated before it is introduced. The beak of the metal instrument should always be made to hug the upper wall of the urethra as it glides along into the bladder.

A patient to be catheterized should assume the recumbent position upon a bed or couch, with the head and shoulders slightly elevated and the legs separated. Preceding the introduction of the catheter, a two per cent solution of cocaine

can be instilled along the urethral track, rendering the operation absolutely painless. The catheter should be smeared with some sterilized lubricant and introduced while the penis is held in a slightly extended position upward and as the beak of the instrument engages the point in the urethra, surrounded by the triangular ligament and encroached upon by the prostate gland, the penis, including the catheter, should be depressed between the thighs and at the same time the penis should be extended upon the instrument, while the latter is gently forced forward into the viscus. While executing this step in the procedure in cases of enlarged prostate, the entrance of the instrument into the bladder is materially aided by introducing the forefinger into the rectum and elevating the advancing end of the catheter, while it is carefully pressed forward into the bladder.

After the catheter has passed to the deeper portion of the urethra, care should be taken to keep the beak of the instrument in the median line and not allow it to deviate to either side, otherwise its passage is seriously impeded. The entrance of the catheter into the bladder will be at once determined by the flow of urine, unless the eye of the instrument be obstructed by a clot of blood, which not infrequently happens; in this case the instrument should be withdrawn, the clot removed, and the catheter reintroduced.

In spasmodic conditions of the deep urethra, the introduction of the catheter should be preceded by the injection into the urinary outlet of water as hot as can be borne or the administration of one-sixth grain of heroin or one-fourth grain of morphine, given hypodermically, on the inside of the upper part of the thigh, some little time before attempting to catheterize. In cases of retention, this method of treatment often causes sufficient relaxation to allow the bladder to free itself in the natural way.

If unfortunately the beak of a metal catheter is forced through the sides of the urethra, making a false passage, catheterism is afterwards performed with much difficulty, the highest order of skill and tact being necessary to introduce the point of the instrument past the false opening.

Very little injury, if any, is inflicted in the urethra by the

use of silk, soft rubber or gum-elastic catheters, and for this reason men who have to draw their urine provide themselves with catheters of this kind.   With no obstructions they are very easily introduced when lubricated.   The soft rubber catheter may be kept sterile by boiling and then placing in sterile glass tubes.   The silk and gum-elastic instrument cannot be boiled or even placed in hot water, as either course blisters the smooth surface and dissolves its texture.   To sterilize these catheters, they should be immersed in a 1-3000 bichloride solution, rinsed in sterile water and lubricated with carbolized oil or other antiseptic preparations.

In cases of infective urethritis, the urethral canal should be irrigated with a warm solution of bichloride 1-10000, or permanganate of potash 1-5000, previous to introducing the catheter.

Glass catheters are in common use in female troubles of the bladder; they are readily sterilized and easy to keep clean. They are to be preferred to the rubber or metal instrument which can be used if the glass catheter is not at hand.

Steel sounds are introduced into the urethra to dilate soft strictures and into the bladder to determine the existence of stone.   To accomplish the first object, graduated sounds are used, starting with an instrument that can be passed without inflicting severe pain and then others of larger size until the strictured portion is overcome. Sounds prepared for use should be boiled in a one per cent solution of carbonate of soda for ten minutes and then placed in sterile water, or the instrument may be passed through an alcohol flame and then lubricated with carbolized oil before introduction.

Filiform bougies or very small whalebone guides are often made use of to find the passage through a strictured and tortuous portion of the urethral canal. These tiny guides are usually of one size and slightly bulbous at the entering end. The tip can be bent to any desired angle by first dipping it into boiling water. Before using these guides, they should be sterilized by placing them in bichloride solution 1-3000 and then in sterile alcohol. If it is found impossible to pass a single bougie through the strictured canal, one after another should be introduced within the urethra until a half dozen or more are passed,

all engaging the obstruction. To aid the passage of these guides, the urethra should be previously filled with carbolized oil. The urinary canal is next straightened by making slight traction on the penis, when an effort should be made to pass one after another of the guides through the stricture until one finds its way through and into the bladder, where it is sometimes left for twenty-four hours, or a tunneled catheter may be passed, using the tiny whalebone as a guide. (See Cut.)

Silk and linen catheters

English web catheter with stylet.

Gouley's tunneled catheter

Double current catheters.

Male, prostatic, nickel-plated.
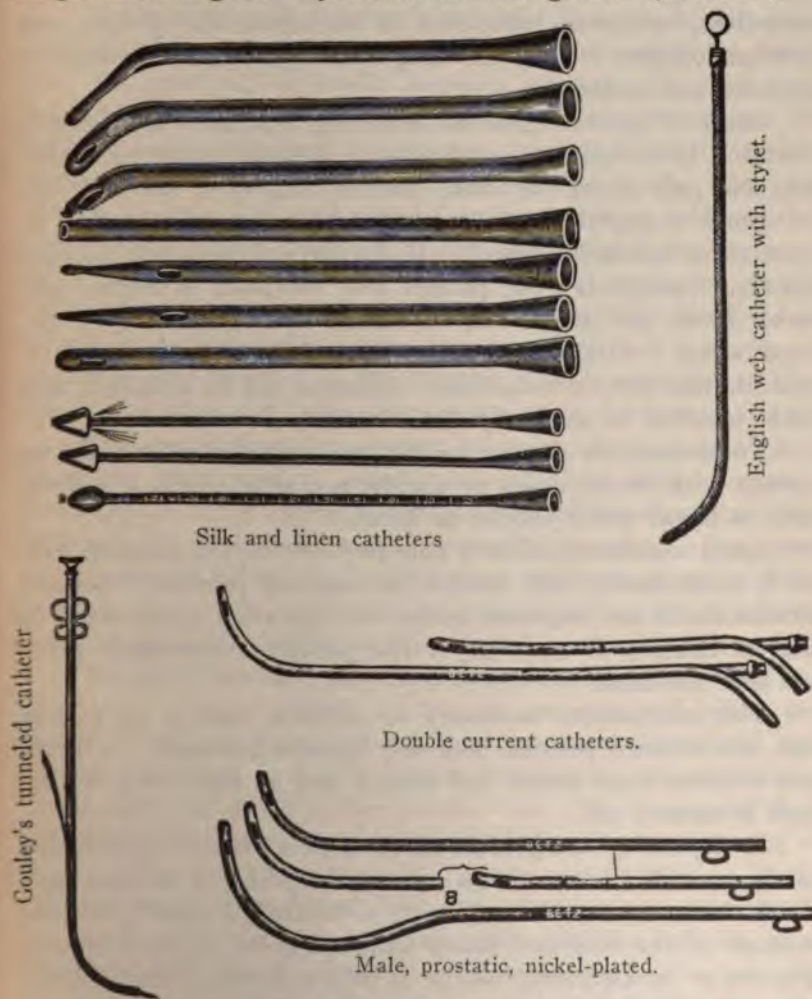
Fig. 36.—Urethral Catheters.

TAPPING—ASPIRATION

Tapping is an operation frequently resorted to for the evacuation of fluids from mucous and serous cavities of the body. In cases of serous effusion the operation should be executed, if possible, without the entrance of air into the cavity.

The operative procedure is often resorted to for relief in cases of empyema and effusions within the pleural cavities; also in ascites, tubercular abscesses of the spine and joints, and hydropericardium; and for diagnostic purposes in obscure growths, and hydrocele.

Cases of pleural effusions requiring aspiration are usually indicated by cough accompanied with difficult breathing, tightness and pain about the chest, marked bulging of the intercostal spaces, a displaced apex-beat, dullness on percussion, and in most cases decided cyanosis. If the effused fluid has become purulent (empyema) the patient will complain of rigors and hectic fever, and there will be edema of the muscles of the chest walls. Gurgling of the pent-up fluids can be heard on auscultation, but no respiratory murmurs are in evidence, and vocal fremitus is markedly diminished.

To prepare the patient for aspiration the bowels should be opened with liberal doses of the salines, after which a general bath in borax water should be taken.

Local anæsthesia with a four per cent cocain solution given hypodermically will render the tapping painless. General anæsthesia is not required, unless the operation is extended to that of incision or excision, or the patient is extremely nervous and excitable.

The instruments necessary to perform tapping or aspiration, are a sharp pointed bistoury, hypodermic needle, a small and medium sized trocar and canula, and an aspirating needle, with a vacuum jar.

In aspirating the pleural cavity a point is usually selected in the seventh intercostal space, near the posterior axillary line. With the soft parts thoroughly anæsthetized, a small puncture is made in the skin and fascia with the point of the bistoury. The trocar or aspirating needle is then introduced through the puncture and underlying tissues into the pleural cavity, care al-

ways being taken not to thrust the needle in too far, so as to wound the lung. The fluid should be withdrawn slowly, and the condition of the patient watched during the time. If symptoms of syncope appear, the operation should be suspended for the time, and continued as the patient revives. At the conclusion of the operation the wound in the skin should be closed with a piece of oxide of zinc plaster, or sealed in with gauze and collodion.

In some cases of purulency the fluid is so thick, and often contains flakes of fibrin or accumulations of matter so large, that the point of the needle becomes blocked. In such cases a large trocar should be used, regardless of air getting into the cavity. Cases requiring incision into the pleural cavity, for the evacuation of blood clots and thick purulent fluids, often discharge for days and weeks, and then heal with no evidence that the entrance of air delays or in any way hazards the recovery. It is essential in every case that the pleural cavity be cleared of all the fluid as soon as possible, adopting the method best suited in each individual case to accomplish the purpose. A drainage tube inserted in the incision is often required to keep the wound open and hasten the evacuation of the abnormal fluid.

The evacuation of an excess of synovial or purulent fluid from the knee joint is usually accomplished with a medium sized trocar or the aspirator, under strict antiseptic precautions, although the joint is frequently opened by incision in bad cases of this nature, when the morbid state originates from tubercular infection. The work may be done under cocain or chloroform anæsthesia. With the knee flexed nearly at right angles, a puncture in the skin and superficial fascia is made with the point of a sharp bistoury, a little to one side and below the center of the patella. Through this punctured wound the trocar or aspiration needle is thrust, penetrating the underlying tissues and just entering the synovial sac. The evacuated fluid will likely be turbid in appearance, whether it contains pus or not. This can only be decided by a culture test. If the effusion is simply synovial fluid, the wound in the skin should be closed with collodion or zinc oxide plaster, and the knee bandaged and placed at rest in an extended position. In case the morbid condition of the joint proves to be tubercular, the

cavity should be injected with iodoform emulsion (four drachms to glycerine one ounce), or the synovial membrane may be incised, the fluid evacuated, and then washed out with bichloride solution 1 to 2000. To make this form of treatment effective, necrotic bone tissue should be curetted out when possible to get to it, and in most cases drainage should be established.

The elbow joint is treated in like manner, and for similar reasons. When effusion takes place in the elbow joint, the fluid distends the capsule backward, and it bulges out on both sides of the triceps tendon. After the elbow has been rendered aseptic the fluid is withdrawn with the aspirator, the needle being introduced generally on the outer side of the tendon, through a small puncture made with a bistoury. The concluding treatment will be the same as advised in tapping the knee joint.

Other joints similarly affected should be treated in the same way as the knee and elbow joints. The after treatment following operative procedures should consist of antiseptic washes, drainage when required, bandaging, and keeping the part at rest till recovery takes place.

CUPPING

Depleting a part of the system by the local abstraction of blood is frequently resorted to for relief from inflammatory affections. A popular procedure to accomplish this method of depletion is by applying wet or dry cups to the inflamed area. To accomplish the act successfully, the cupping glass should first have the air exhausted from it by burning in a glass, a small pledget of absorbent cotton, soaked in alcohol. Before the flame is entirely extinguished, the glass should be quickly inverted upon the selected area of the skin. In this way one or several cups may be applied. If no blood is to be abstracted, the part is not scarified before the cup is applied; this is what is know as dry cupping, but should the operator wish to abstract blood from the inflamed part, it should be rendered aseptic by washing and drying, after which the dry cup is first applied; after remaining in situ for a few minutes it is removed and the cupped part scarified with a bistoury and the cup re-

applied, using the same precautions to exhaust the air before adjusting the cup. In the absence of cupping glasses, small wine glasses may be substituted. By this method of depletion in local inflammatory states, from one to three ounces of blood may be drawn at a sitting, as the nature of the case will determine.

Dry cupping is chiefly resorted to in the treatment of functional derangement, as inflammation of lungs, kidneys, liver and bronchi, and in cerebral congestion, when the cups are applied to the nape of the neck.

Wet cupping, or abstracting blood from the affected area, is preferred in sthenic inflammatory states, especially of serous parts of the system.

It is not advisable to apply cups to bony prominences, intercostal spaces and the mammary glands.

PLASTIC SURGERY

The restoration of external parts of the body destroyed by injury or disease, and congenital defects, by operative measures, is called plastic surgery.

The more common operations coming under this surgical head are those upon the eyelids, lips, nose and mouth. However, a loss of a small area of cutaneous tissue on the neck, or upper part of the chest, from accidental causes, may be covered in by one or more flaps of skin taken from parts adjacent to the injury. Two methods are employed in executing the work, the nature of the injury or defect determining which of these will be required. Approximating the freshened edges of clefts in the lips or nasal alæ when narrow, and retaining them with sutures, is one form of procedure. It often becomes necessary to free the lips on either side of the cleft from the underlying bony structures a sufficient distance to relieve undue tension on both tissues and sutures.

The other method in common use is the covering in of the defect with a suitable sized flap taken from the adjacent sound integument, and twisting it upon a substantial base, which is left intact with the connecting tissue, and made to fit the open

wound or chasm. If the flap is properly formed its vitality will be insured by the vascular supply obtained through the base or pedicle. It will be well to bear in mind while forming the flap that it should be a little larger than the space it is intended to span, to allow for the usual amount of contraction.

The conditions requiring plastic operations differ so much in character that there must be, of necessity, many modifications in the formations of flaps to meet the requirements in each individual case. Not infrequently a case will present where it is quite impossible to secure a flap of sufficient shape and size to cover the denuded surface from the adjacent parts, making it necessary to take it from some other part of the system, or from another individual. It is better not to remove the dressings for three or four days following the operation, for fear of endangering the uniting of the flap to the wounded surfaces. The fourth day the first dressings may be replaced with sterile gauze, or lint lightly held in place with bandages or strips of adhesive plaster. Catgut, silk-wormgut, or the pin and figure-of-eight strand are used for suture material. The nature of the injury in each case will determine the kind of suture that should be used. An important precaution to be observed in transplanting flaps of integument is the control of all hemorrhage before placing the flap in position, otherwise a clot may form, which will later break down, resulting in a complete failure of the operation.

When the integument is very thin on the part from which the flap is to be taken, a thin layer of the sub-cutaneous tissue should be dissected up with it, to insure a better blood supply to the flap.

It will be well for the operator, if not an adept in plastic work, to mark out the form of flap required with a pencil before attempting to dissect it up. The raw surface from which the flap is removed can be covered by approximating the opposing edges of the skin as far as possible with silk-wormgut sutures, and if the span be too great to close in this way skin grafts may be planted to help bridge the chasm.

Hare-lip operations are executed for the removal of malignant tumors and loss of tissue substance, either from injury or congenital defect.

Fig. 37.—Hare-lip complete.

After the parts to be operated on have been rendered asep-
the patient, if a child, should be placed under the anæsthetic

Fig. 38.—Operation for hare-lip: A. B. C. D. the de-
nuded margins of the lip to be united with catgut or
figure-of-eight sutures.

effect of chloroform, and the arms secured to the sides by pinning a towel around the chest. It should be placed in the upright position in a chair, or held in the arms of an assistant, to prevent the hemorrhage, which is sometimes quite profuse, from passing back into the throat, interfering with the respiration during the operative work. In single hare-lip it will only be necessary to prepare the edges of the lip on each side of the cleft, after which they are approximated and held securely by catgut or pins and figure-of-eight sutures. To prevent the V-shaped depression in the margins of the lip caused by the contraction of the scar tissue, a small flap can be cut across the angle of one side of the lip and slid a little way over the angle of the opposite lip, after it has been freshened, and there secured by one or two catgut sutures.

If the case presenting is for the removal of a tumor, or malignant ulcer of the lower lip, that does not extend deeply into the tissues, the morbid mass can be dissected out with curved scissors and covered in by a flap dissected from the chin.

If the operation is for the restoration of a part or whole of the upper lip, the flaps can be taken from the cheek near the nose. The edges of the flap should be cut squarely, as well as the opposing border to which it is to be joined. The work should be done under strict antiseptic precautions. Catgut and silk should be the suture material used, which can be removed in ten to twelve days if no unfavorable conditions arise.

In double hare-lip cases, the operative measure are somewhat more intricate. The edges of the middle segment are to be freshened, as well as the margins of the lateral defect. If the span is not too wide, the margins may be approximated and sutured, especially if each lateral flap is loosened from its bony attachment by an incision underneath, to give a redundancy of tissue. If the cleft be so wide that this procedure will be impractical, lateral flaps may be cut from the sides of the middle segment, and one from each lateral border of the lips, the incision commencing at a point near the nostrils and ending near the lower border of the lip, as represented in the accompanying cut. The flaps cut from the middle segment

Fig. 39.—Double hare-lip operation. F. G., marginal
flaps, which will form the border-line of the lip turned
down and united with catgut.

are turned upward and outward and made to form a floor to
each nostril by suturing it to the opposite side of the chasm
after it has been freshened. The flap of the border of the lip
on either side of the chasm is then turned down and the edges
of the cleft brought together and secured with silk or catgut.
Usually the lip on either side of the chasm will have to be freed
from the underlying bone well up to the alæ of the nose to give
a redundancy of tissue to prevent undue tension on both ·
sutures and tissues involved.

In placing the sutures, the middle ones should be intro-
duced first and the little flaps stitched in place last.

A light gauze dressing may be adjusted to the wounded
surface and held in place by strips of adhesive plaster. The
stitches should be removed about the tenth day.
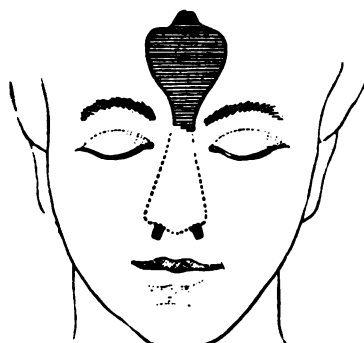
Fig. 40.—Rhinoplasty. A flap, composing skin and fascia,
taken from the forehead to form the new nose.

Special forms of plastic surgery, such as the restoration of

the nose, are called rhinoplasty. The operation is done to restore a part or the entire organ. To restore the whole organ, the flap is formed from the skin of the forehead and is fashioned as represented in the accompanying cut.

The operative technic consists in freshening the margins of the healthy tissue around the defect of the nose, and approximating a suitably fashioned flap to the open space, taken either from the forehead or the anterior part of the arm. As previously stated, the flap should be some larger than the space it is intended to cover and to be properly adjusted, it should be cut from a pattern previously fitted to the open wound or defect. The flap, of necessity, will be triangular in shape, its apex left in contact with the skin at the root of the nose through which the vitality of the flap is insured. If the flap is taken from the arm its apex is left connected with the skin and long enough to be later cut free and adjusted to the margins of the defect remaining to be covered. The flap, if taken from the forehead, should contain the periosteum; if from the arm, it should contain the skin, fascia, and a thin portion of the subcutaneous tissue.

The tongue or middle segment of the base of the flap will, after it is stitched in place, form the septum to the artificial nose. The lateral portions of the base of the flap, after they are adjusted and stitched in place, will form the alæ of the nose. While the flap is being adjusted, two short pieces of rubber tubing are properly placed, around which the nasal orifices are formed.

The gaping wound left after dissecting up the flap can, at least, be partly closed by drawing the margins toward the center with silk or silk-wormgut sutures; skin grafts may be needed to aid in closing the wound. The flap is secured to the freshened margins of the cheeks and upper lip with simple catgut or silk, if preferred.

There is more or less disfiguring of the field of operation by the fold at the edge of the orbit, caused by the reflection of the flap; this defect can, however, be remedied at a later date, after the flap has united. Dissecting up a flap from the forehead, embracing all the soft tissues and outer table of the skull, to remedy the deformity of the nose, known as **saddle-nose**, does not meet with favor with modern surgeons.

The deformity can better be overcome by making an incision, of the required length, along the side of the nose, dissecting up the tissues to the extent that an artificial bridge, made of platinum and suitably fashioned, can be slipped through and adjusted over the depression in the nose; this accomplished, the incised borders are approximated and secured with several cat-gut sutures. Of late, attempts have been made to fill in the depression in the nose with paraffin, injecting the waxy material under the skin and fascia with a large hypodermic needle, while it is in a melted state. In selected cases, the method has been successful. It is fashioned to the required shape while cooling.

A shallow cleft in the border of either lip, caused by accident, or the result of congenital defect, can ofttimes be remedied by making a wide inverted v-shaped incision, the required distance

Fig. 41.—(1) The first step in the repair of partial hare-lip.

(2) After incision, the margin of the lip is pulled downward with a blunt hook, as shown in the illustration.

(3) The traumatic margins of the lip are approximated, and fixed with catgut or hare-lip pins, the latter being preferred, if the tension is great.

from the edge of the lip, to form flaps, the apex of which is left attached and then turned down, bringing the raw surfaces together, where they should be joined with catgut or pin and figure-of-eight sutures.

Plastic operations upon the eyelids are done to replace tissue lost by accidental means, where the span is too great to

heal by granulation and to correct any abnormal state of the lids, resulting from congenital defect. If the tissue is destroyed over the greater part of one or both lids, they should be kept closed during the time of repair and some time thereafter, to prevent scar-tissue retraction. When the lids have been closed for a long period of time, they should not be fully separated at the first effort, better a little at a time, watching in the meantime whether or not cicatricial contraction is likely to ensue.

To close the lids temporarily by operative methods, is called blepharorrhaphy and is executed as follows: The marginal conjunctiva just within the border, containing the lashes, is carefully dissected away, over two-thirds of the middle portion of each lid, the inner and outer commissures left free to give exit to the flow of tears. The margins of the lids are brought together and sutured with silk or fine silver wire, which are removed in ten days or two weeks. When it is required that the lids be separated, this is done by cutting down between the two rows of lashes upon a grooved director or guide, slipped through the outer unclosed angle of the lids and thence along the line of the closed margins.

Fig. 42.—Canthoplasty.

Canthoplasty is a term signifying an enlargement of the palpebral opening, by dividing the integument and conjunctiva horizontally with scissors upon a grooved director to the re-

quired distance and then uniting the edges of the conjunctiva and skin together with fine catgut or silver wire. A two per cent solution of boric acid is used as a collyrium for a few days following the operation, to control irritation and aid in the healing process.

This form of operation is sometimes resorted to in cases of entropion in spasmodic contraction of the orbicularis muscle.

Plastic operations upon the eyelids for the relief of ectropion, are successful to a greater or less degree. A reasonably sized V-shaped flap, with its base directed toward the border of the lid, is fashioned from the integument below the margin, the incision only extending through the skin and fascia and without dissection in most cases. As the everted margin of the lid is made to assume its normal position, the flap is drawn

Fig. 43.—The V. Y. operation for ectropion. The incisions have been made and the sutures placed. (*May*).

Fig. 44.—The V. Y operation for ectropion completed. (*May*).

upward, leaving a slight gaping wound below, which is later closed with silk, or pins and figure-of-eight suture. The edges of the lids are fashioned, as before directed, and united with sutures and held in closed position while the fresh wound below is uniting. (See Cut).

Numerous other operative methods to overcome the disfigurement of ectropion, are followed by surgeons of repute, each having some feature to commend it in its application to some form of the abnormal state. For a detailed technic of

these methods, the reader is referred to special volumes on the treatment of diseases of the eye.

Entropion is the inversion of the margins of the lid. The deformity causing the eye-lashes to come in contact with the eyeball, setting up a lasting conjunctivitis.

Fig. 45.—The Hotz operation for entropion.   (*May*).

The morbid state is either due to spasm of the orbicularis muscle or to contraction, caused by traumatism. The lower lids are more frequently affected than are the upper, and the degree of morbid action will depend upon the extent of the inversion.
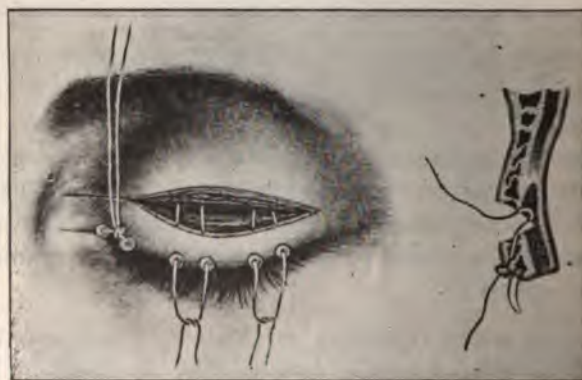
Fig. 46.—The Steatfelld-Snellen operation for entropion. One of the threads has been tied. (*May*.)

Surgical measures offer the only source of cure in the severer phases of the disease, although mild forms of the affection may be relieved by the application of little strips of isinglass plaster, applied horizontally to the partially opened lid, or the application of collodion under the same conditions.

Surgical procedures for the permanent cure of the morbid state are the enlargement of the palpebral opening, when due to spasm of the orbicularis muscle, already referred to; picking up a horizontal fold of the skin and fascia of the lid and passing several silk ligatures, tightly tying, allowing them to remain three weeks or more, until they cut their way out, or the fold becomes permanently fixed, and the removal of a suitably sized

Fig. 47.—The lines of incision indicate the form of flap to be removed for the cure of entropion, after which the margins should be joined by fine catgut sutures.

flap of integument from the lid, triangular in form, with its base directed toward the edge of the lid and then approximating the edges of the wound and securing them with pins and figure-of-eight suture. The size of this triangular flap is about a third of an inch at its base and extends to a converging point about one-half inch from the base line. (See Cut.)

Pterygium is an abnormal vascular and fibrous growth on the conjunctival surface of the eyeball, extending from the inner angle of the palpebral opening by a broad base and terminating at the margin of the cornea, or extending over a goodly portion of its surface. It is more frequently found on the nasal than on the outer side of the eyeball, and if very vascular it is gradually progressive. In marked phases of the morbid state, the growth is raised above the adjacent conjunctiva, its

vascular system readily observed and is seemingly composed of loose cellular tissue. The local vascular growth is observed most frequently in persons who have weak and irritable eyes and those of middle and later stages of life.

Fig. 48.—Pterygium. (*May.*)

The treatment of pterygium is by constringing the blood vessels with caustics, excision and ligation. The former method is only applicable to those cases where the growth is very thin and the arteries lie very superficial; after the morbid area has been cocainized, a sharp pointed splinter of wood or tooth-pick is made to penetrate the soft tissue down upon the arterial twig, after it has been dipped in nitric acid and allowed to dry somewhat. Each blood vessel is treated in like manner till all
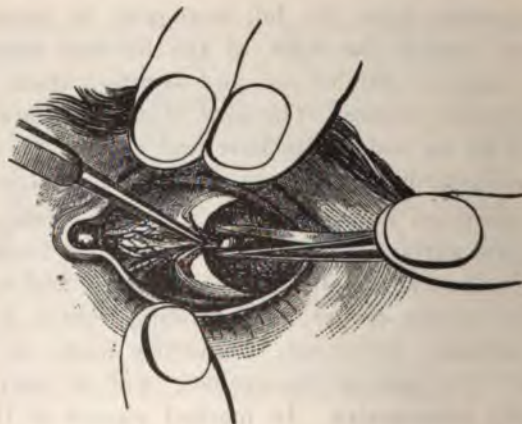
Fig. 49.—Removal of a pterygium by dissection. (*Howe.*)

have been reached. Seldom is a second treatment required, if the first is properly done.

If excision of the growth is decided upon, its inner extremity, or apex, is picked up with the thumb forceps, and with knife · or scissors the vascular mass is dissected free from the underlying tissues; the edges of the conjunctiva are then approximated and sutured with very fine catgut. The eye should be bathed with a two per cent solution of boric acid and kept bandaged a few days.

If the pterygium be of large size, ligation of the morbid mass usually proves successful. Two very thin curved needles are armed with a double ligature of silk, about one foot in length and passed under the inner and outer extremity of the growth as shown in the accompanying cut. The ligature thus
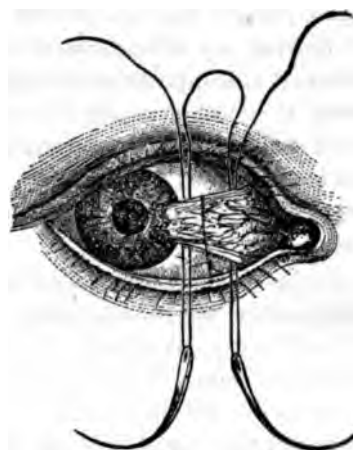
Fig. 50.—The strangulation of a pterygium with ligatures. (*Howe.*)

placed, the needles are cut free, leaving strands for three ligatures, one for each, end to encircle the growth and the middle one, when tied tightly, will separate the attachment of the fleshy mass from the sclerotic coat. If the operation is properly done, the growth will shrink and separate from its attachments in a week or ten days. During the time that the ligatures are cutting through the tissues, inflammatory action can be subdued by bathing the eye with boric acid solution and keeping the eye closed and bandaged.

Trichiasis, or ingrowing eyelashes, caused in most cases
by chronic opthalmia, often causes acute pain, photophobia, ab-
normal vascularity and haziness of the cornea. Persons afflicted
with this abnormal state of the eyelids often aggravate the
trouble by attempting to remove the "wild hair," as they call
the inverted or incurving lashes, with nippers that are not
fashioned for the purpose and not altogether aseptic. Not in-
frequently, neglect on the part of the patient in the proper care
of the diseased   state, eventuates in partial or total loss of
vision.

The treatment by removal of the inverted lashes, is only
temporary, as new hairs soon make their appearance and assume
the same position as did the "wild hairs," previously removed.
Permanent benefit is secured by removing a narrow strip of
skin from the lid and joining the margins of the skin with fine
catgut sutures, or picking up a horizontal fold of the integu-
ment and placing several silk ligatures through it, allowing them
to cut their way out, if possible, as in the treatment of entro-
pion. If the morbid state is due to spasmodic contraction of
the orbicularis muscle or a contraction of the palpebral opening,
a slitting of the external canthus will remedy the defect and
may cure the disease.

Occlusion of the lachrymal canal, causing an overflow of
tears, and not infrequently an inflammation of the lachrymal
gland, eventuating in abscess, requiring operative measures for
relief and cure, naturally comes under the head of plastic sur-
gery. During the progress of the disease there is heat, pain
and swelling with throbbing in and around the nasal duct, with
increased secretion of water, sometimes mixed with mucus and
pus. The area immediately surrounding the inner canthus be-
comes red and very tender to the touch, indicating the nature
of the local disturbance. By relieving the local inflammation
and congestion with topical application of refrigerant remedies,
as solutions of witch-hazel and water, tr. of arnica and water,
with a few drops of adrenalin chloride added and emollient
poultices applied, the nasal duct may open up; otherwise an ab-
scess will form, which will sooner or later find exit upon the
surface of the skin near the eye.

A permanent cure attaches to the opening up of the canal.

If the medicinal agents above mentioned, topically applied, do not accomplish this end, operative measures will have to be resorted to. Opening up the canaliculi may be all that is necessary to give vent to the secretions of the eye; if not, an attempt should be made to catheterize the nasal duct with a delicate bougie or silver wire. The canaliculus will first be opened up and the lid drawn outward to straighten the canal, to aid in the passage of the instrument. This can be done quite readily, unless a stricture exists or the duct be obstructed with a calculus. If it be determined that a stricture exists, it should be divided with a narrow probe-pointed knife, cutting it in at east three different directions. This operative procedure is executed by first slitting up the canaliculus. The work can be done under cocaine anæsthesia, a few drops of a four per cent solution being thrown into the canal with a hypodermic syringe, the sharp point of the needle having been ground off; suppurative states of the canal can be medicated in this way, by injecting a small amount of a twenty per cent solution of iodine or phenol sodique, or, a five per cent solution of biborate of soda. The latter is of special benefit, if the parts are tender and inflamed, especially if used quite hot, and three or four times a day.

Uranoplasty or the closure of congenital defects of the hard palate, rightfully comes under the head of plastic surgery, hence it will be briefly considered here.

The defect, which is frequently met with in surgical practice, consists of a fissured state of the hard palate to a certain degree, the width and length of the fissure varying from a few lines to a half-inch or more. The gap may commence at the tip of the uvula, completely severing this muscular body and extend part way or the entire length of the hard palate to the lip in front.

A child having a cleft palate, arriving at the age at which it begins to talk, has more or less difficulty in the pronunciation of many words, it being impossible to give the proper sound to some letters that they may be understood. It is not uncommon to find a hare-lip and a cleft uvula or hard palate existing in a child at the same time, the abnormal state of the

lip giving rise to the greater deformity, but affecting less the enunciation of words.

Without doubt, the arrest of development in many cases is due to hereditary influence, the father or mother of the child having a similar defect or perhaps some relative of a previous generation.

In the worst phases of the defect, the cleft is so wide that it will be impossible for the child to nurse without the escape of milk from the nose in efforts to swallow. It often becomes necessary to feed the child with a spoon or from a nursing bottle with a very long nipple, the child being placed, in the meantime, in a position most favorable for the swallowing of the nourishment. Frequently the fissure is wider behind than in front, then again the defect may merely constitute an oval fissure in the median line in the center of the hard palate a half-inch or more in length and very narrow. In those cases, where little of the soft and hard palate remain, a flap of mucous

Fig. 51.—Operation for the closure of cleft palate.

membrane of the desired length and width will have to be dissected from either side of the cleft, first paring the edges of the defect. The base of these flaps will be posterior near the soft palate and extend, in thickness, to the bone; they are dissected up with a thin bladed knife, curved on the flat and placed in the
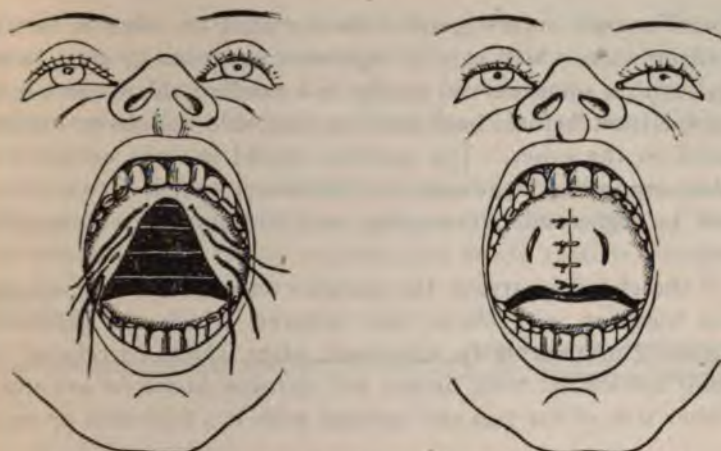
Fig. 52.—Operation for the closure of cleft palate, continued.
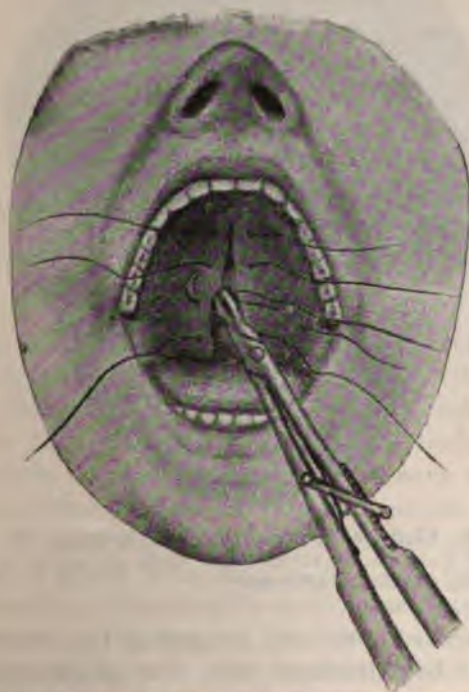
Fig. 53.—Incomplete cleft palate. Showing method of introducing the sutures of silk-wormgut or silver wire, after the margins of the cleft have been denuded. (*Farnum.*)

median line and sutured with silk-wormgut or what is better, fine silver wire, which can be tightened by twisting after being placed, with a small curved needle in a needle holder; the needle is passed from before, backward on one side and from behind, forward on the other. The sutures should be four or more in number, according to the extent of the fissure, and if of wire they should be tightened by twisting, and the ends cut reasonably short.

If the cleft be narrow, the margins should be freshened and drawn together with silver wire sutures, which are tightened by twisting as previously suggested, after which, to relieve the existing tension on both tissues and sutures, incisions are made on either side of the gap and parallel with it a half-inch or more

Fig. 54.—Cleft palate repaired. The openings on either side of the line of sutures are made to relieve tension upon the stitches. (*Farnum.*)

from the border of the defect. In placing the sutures, the middle one should be introduced first, the others following, care being taken to approximate the edges without puckering the tissues. None are tied until all are placed. The lateral halves of the uvula should be joined with silk. During the time of plac-

ing the sutures mops of cotton batting are utilized to free the traumatic surfaces from blood and mucus, that the operator may the more rapidly execute his work. If there be no post-operative complications, the sutures can be removed the eighth or tenth day.

It is not an easy procedure to place and tie sutures in the margins of a cleft in a high arched mouth with a curved needle in a needle holder, as any surgeon can verify that has made the
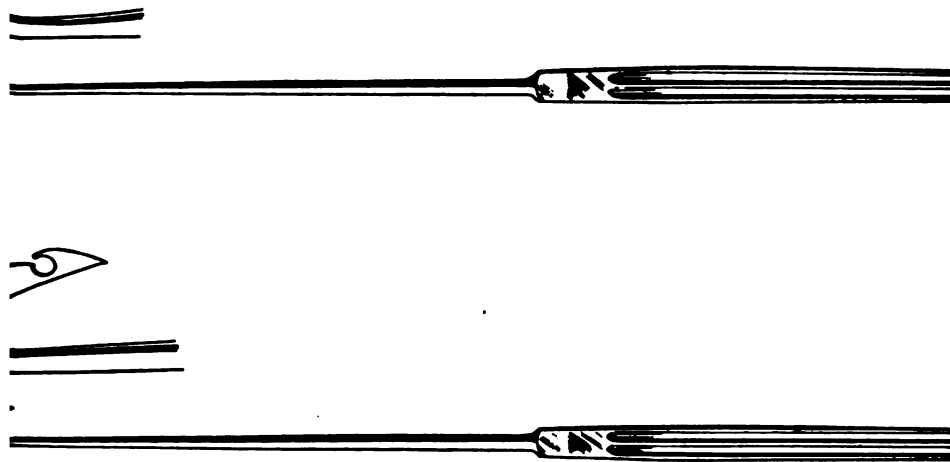
Fig. 55.—The author's open-eyed needles for cleft palate operations.

attempt. To execute the work more easily, the author had made two long needles, curved at the end, one with an open eye, and one long, straight needle with an open eye, each fastened in a metal handle, that they may be easily sterilized by boiling. (Fig. 55.) After the margins of the cleft have been pared, a suture of silver wire is passed through one margin of the fissure from behind forward by the aid of the curved needle, the end of the suture is seized with snap forceps and drawn forward, when the needle is withdrawn backwards and made to engage the opposite side of the fissure, as it did the first; the curved point of the needle is withdrawn as before, and as the eye is open, the instrument is made to free itself from the silver strand; the required number of sutures are then placed in like manner and snugly tightened by twisting with forceps.

The straight needle is utilized to place the sutures in those extremely high arched cases, where the margins of the cleft rest close to the vault of the pharynx and it would be difficult to make use of the curved needles on account of lack of space. In using the straight needle, it is introduced from before backward; after emerging from behind the edges of the cleft it is made to pick up one end of the suture material and bring it into place as the needle is withdrawn. The other end of the suture is placed in the opposite margin of the cleft, in the same way as was the first. With a little practice, it will be seen that these instruments have a decided advantage over the short, curved needle or the long, hollow, curved needle, in introducing sutures in the cleft palates in high arched mouths.

The pain and distress following the operation are not of a severe nature and all hemorrhage soon ceases. The child may be restless and fretful for a time and may need an anodyne to bring periods of sleep. The nourishment should be given in fluid form for a few days and if old enough, the mouth should be cleansed occasionally with weak salt water or some pleasant antiseptic wash.

Every effort should be made to prevent any strain placed upon the sutures through the child crying, coughing or talking. These observations complied with, success will follow the operative work in most cases.

PART SEVEN

Affections of the Skin and Sub-cutaneous Tissues

CUTANEOUS DISORDERS

There are numerous forms of skin diseases that are commonly met with in surgical practice, many of which result from the systemic taint, and are difficult to cure.

No attempt will be made to describe other than those disses of frequent occurrence, in this work, special treatises on in diseases being cited to the surgeon wishing to extend his lowledge of cutaneous disorders.

Skin diseases may be due to some local cause, as a burn, ruise, sting, or traumatic injury; or the morbid state may be aused by some systemic disturbance, as erysipelas, herpes, mallpox, eczema, etc., etc. The disease, when due to local auses alone, may be successfully treated by topical applications, with due attention to cleanliness and diet, without resorting to constitutional remedies; while the local manifestaions of systemic disorders will demand alteratives, peptics and onics, in connection with such remedial agents as will suggest hemselves for local application.

Purpura

The term purpura has reference to an acute affection of the in and mucous membranes, characterized by the appearance purple spots, varying in size from a pin-head to patches as ge as the palm of the hand, occasioned by an extravasation blood into the tissues. At first the local manifestations e claret, or purplish red in color, which gradually change to greenish or yellow hue, frequently noted in bruises.

There are three varieties of the disease usually described,

which is not essential, from the fact that the several forms of the morbid condition are but different degrees of severity. Purpura simplex, or the primary form of the affection, is usually ushered in suddenly, numerous small purplish-red colored blotches appearing on the lower extremities—rarely on other portions of the body. The blotches do not elevate the surface of the skin, nor are there any general symptoms present indicating the presence of the disease. The spots remain but a few days. They change from the purple hue to a yellow color, and soon fade away.

In purpura rheumatica about the same physical symptoms present as in the primary form of the disease, and in addition the patient may have more or less fever, loss of appetite, with general malaise, and marked rheumatic lameness and soreness of the extremities and joints.

Purpura hemorrhagica is the most aggravated form of the disease, and is characterized by fever and marked states of depression. The hemorrhagic blotches, of various sizes and severity, not only appear upon various parts of the body, but on the mucous surfaces as well. Hemorrhagic oozing often occurs from the gums, and nose, as well as from the bladder and intestinal canal. This continual loss of blood not infrequently results in systemic weakness, and has been known to lead to a fatal termination.

Certain drugs, that exert powerful systemic effects, frequently bring out eruptive blotches akin to purpura; quinine and the iodides are of this class.

Treatment.: As the morbid state is the result of some systemic taint, it will be well at the outset for the treatment to be directed to the relief of any such wrong that may be noted after due observation. Absolute rest should be enjoined in cases where the system has become enfeebled from frequent hemorrhages. The fact that the disease is depressing and depleting in character, plainly indicates that the medicinal agents required to overcome the depraved condition of the blood, and structural weakness of the capillary vessels, are required to possess alterative, tonic, and hemostatic properties; hence iron, arsenic, and the vegetable tonics, are indicated—not losing sight of the fact that the special features of each individual case will

dictate the remedial measures to be followed. As a general systemic tonic the following mixture will be found valuable:

℞.
Mur. Tr. of Iron .... ℥ ij
Phosphoric Acid (Dil.) .... ℥ ss
Syrup Simplex, q. s. .... fl. ℥ iv
M. Sig.—A teaspoonful in a wineglassful of water after meals.

On alternate weeks the following mixture should be substituted for the above:

℞.
Fowler's Solution .... ℥ i
Calcium Lactophosphate (Syrup of) .... fl. ℥ iv
M. Sig.—A teaspoonful after meals, in a little water.

In severe hemorrhagic cases, teaspoonful doses of the following solution, administered every two hours, is commended:

℞.
Spc. Tr. Ergot .... ℥ i
Spec. Tr. Hamamelis .... ℥ iij
Adrenalin Chloride Solution .... ℥ j
Peppermint Water, q. s. .... fl. ℥ iv
M. Sig.—For internal administration.

Spirits of turpentine, in three- to five-drop doses, administered on sugar every three hours, will often prove efficient in hemorrhages from the kidneys, stomach, and the intestinal tract.

The diet should not be of a stimulating character. Eggs, custards, ice-cream with graham crackers, milk, rice, graham bread, and cold drinks to quench thirst; lemonade and juices from fruits are permissible.

To relieve the rheumatic pains, the affected parts should be massaged and rubbed with a solution of salicylic acid in alcohol; two drachms of the former to six ounces of the latter.

DERMATITIS

Inflammation of the skin surface is due to various causes and is met with in different degrees of severity. The common causes of the morbid action are the extremes of heat and cold; systemic diseases as eczema, erysipelas, syphilis, and tuberculous affections; the action of irritant and caustic applications

such as mustard paste, nitric acid, turpentine, caustic potash, carbolic acid, and chloride of zinc; the irritant effect of poisonous vegetable agents, as urtica dioica or common nettle, rhus toxicodendron or poison ivy, poison oak and dogwood; and traumatism, which embraces such morbid affections as cuts and bruises, bites and stings of venomous reptiles, excoriations produced by friction and scratching itching parts with the nails.

The symptoms in common with inflammatory conditions are heat, pain, redness and swelling, accompanied with more or less stiffness of the part. The grade of inflammation will vary according to the nature of the exciting cause producing it. In some cases it may not amount to more than a slight redness of the surface without other characteristic symptoms being present, while in others the inflammatory action runs so high that the surface becomes studded with vesicles or blebs that may, at a later period, be converted into pustules or small ulcers, and even cause death to the part.

In eczematous states, there is generally an exudation of a gummy serum into the inflamed tissues, which finds its way to the surface in moist patches, whenever the affected area is irritated by scratching or rubbing. This exudate commonly dries up, forming scales upon the partially denuded corium. This albuminous exudation upon the inflamed surface is one of the chief characteristic features of eczematous disease.

Inflammation of the skin resulting from extreme heat will be considered only in the first and second degree. The first degree produces mere redness of the skin with some soreness on pressure, while in the second degree, there appears upon the inflamed surface vesicles or blebs of various sizes, and in connection there will be hyperemia and marked tenderness of the affected part, upon pressure.

The inflammatory state of the skin due to erysipelas is often serious in its evolutions. The morbid action is due to a specific germ, streptococcus pyogenes erysipelatis. The contagious disease is not confined alone to the skin, the subcutaneous tissue generally suffers severely from the febrile affection. The onset of the acute disease is often sudden and characterized by a chill, followed by high fever, headache, thirst, nausea, and sometimes vomiting. The pulse is generally full and rapid, the

ongue coated with an ashen fur, the urine high colored and canty and the bowels constipated. Not infrequently the active ymptoms are preceded by a period of malaise and systemic listurbance lasting for three or four days.

The part affected (commonly the face, except in wound rysipelas) usually presents a dusky red, glistening appearance und puffy at first, and if infiltration of the tissues takes place, he adjacent parts soon become edematous. Under proper reatment, the contagious inflammatory disease usually subsides vithin a week or ten days, with a desquamation of the skin sur- ace. Its disappearance may be for a short period of time only, us it may appear at some other point with equal virulence, s the tendency of the disease is to relapse under disturbed cir- ulatory conditions.

In traumatic erysipelas the infection gains entrance into he system through a wound in the skin, whether this is an ncised wound or an abrasion of the skin surface. This form of he disease is rapidly developed and not infrequently results in uppuration.

Syphilitic invasion of the system often becomes manifest oy an erythema of the skin, which generally appears during he secondary stage and precedes the eruption that often accom- oanies this stage of the disease. The inflammatory symptoms ure not a serious phase of the disease.

The inflammatory lesion of the skin in tubercular disease is generally not of a severe type; and a deposit of tubercle at some point in the inflamed area following the active phases of the disease is not uncommon. Unless the tuberculous mat- ter becomes secondarily infected with some one of the patho- genic micro-organisms, suppuration at the site of the tubercular deposit seldom occurs, although the tubercle bacillus is capable, under favorable conditions, of producing pus.

The severity of the inflammatory lesions of the skin result- ing from the local application of irritant and caustic applications will depend entirely upon the character of the agent and length of time it remains in contact with the external surface. Mus- tard, turpentine and cantharides will actively redden the skin when applied for a short time, while carbolic acid, chloride of zinc and caustic potash will, besides causing active inflamma-

tory lesions, result in the destruction of the tissue. The symptoms following the use of these agents are such as are noted in common with other inflammatory states, heat, pain, redness and swelling, with tenderness on pressure, with sometimes derangement of the function of the kidneys.

Poison oak and ivy sets up an active dermatitis a few hours after coming in contact with these poisonous agents. Usually the onset of the inflammatory action is ushered in with a tingling or smarting sensation, which soon gives way to an intolerable pruritis. To relieve this condition, the patient will resort to rubbing and scratching the affected area, which soon provokes an active hyperemia of the part. Vesicles soon appear upon the inflamed surface, singly and in clusters, which are opened by scratching, the contents coalescing, forming scales over the denuded surface. The usual symptoms accompanying the inflammation are present, heat, pain, redness and swelling, and in connection, more or less fever will be noted during the period of greatest activity. Many cases of rhus poisoning run a course similar to that observed in acute eczema; the sudden onset of the morbid action and the character of the vesicles being the distinguishing features between the two diseases.

The susceptibility of some persons to the poisonous action of these agents, while others are entirely immune from such action, can hardly be accounted for. There are persons who can pluck the ivy from the ground or fence and twist it about the hands without being in the least impressed by its irritant action. Others will be seriously affected by the poisonous emanations of the plant that pervade the air for some distance around about it.

Inflammation following the bites and stings of reptiles and insects is, almost without exception, extremely active and not infrequently devitalizing. There is heat, pain, redness and swelling in the part, the latter being caused by effusion of serum into the skin and subcutaneous tissues. If the blood in and about the wound becomes disorganized, the affected area assumes a dark, purplish appearance, and in extreme cases, the skin and underlying tissues become necrotic and slough.

The local inflammatory action caused by excoriation or denuding the skin by scratching with the finger nails is devoid of

rious symptoms, except in such cases where infection is inoduced into the circulation through the abrasions in the integnent. In this manner septicemic, pyemic and erysipelatous implications are set up that may sorely impress the entire or_inism. In the latter condition, the acute inflammation runs rapid course and is attended usually with rigors, followed f fever, headache, thirst, rapid pulse, a furred tongue, and di-stive disturbances.

Treatment: The treatment of external inflammation should nbrace both local and internal measures; first to remove the use, if this still exists, and secondly to control the local disrbance and restore the diseased parts to a normal condition.

Medicinal solutions having a cooling effect, used topically ion the inflamed area will fulfill all requirements, except in ses produced by infection from external causes or where e local inflammatory action is the result of systemic disease. ie object sought is to relieve the local congestion, which will vor resolution, and this will prevent suppuration and slough-g. A mixture composed of the following ingredients consti-tes an evaporating lotion of great value in local inflammatory inditions:

℞.
    Menthol Solution ....(℥ij to Alcohol ℥vj) ℥vj
    Tr. Arnica .... ℥ij
    Aqua Dest., q. s. ....fl. qt. ij

M. Sig.—Apply to the inflamed area with an atomizer every half-hour or hour, or paint over the skin surface with a cotton swab as often.

Or use the following:

℞.
    Spc. Tr. Aconite .... ℥j
    Spc. Tr. Arnica .... ℥j
    Spc. Tr. Hamamelis .... ℥ij
    Aqua, q. s. ....fl. qt. j

M. Sig.—Paint over the inflamed surface, or apply cloths wet in the solution, every two or three hours.

If used about the face, care should be taken not to get the :ion in the eyes. Equal parts of the tincture of veratrum and lladonna can be painted over the affected area every three urs with much benefit to the patient. This solution should it be used for abraded surfaces.

If the morbid state be due to infection received through cuts or abrasions of the skin, the alkaline antiseptic mixture should be liberally applied. The solution is made as follows:

℞.
    Biborate of Soda .... ℥ iij
    Salicylic Acid .... ℥ ij
    Glycerine .... ℥ ij
    Boiling Water, q. s. ....fl. qt. ij
    M. Sig.—Use as a wash to affected parts.

The menthol and alkaline solutions are potent agents in the treatment of burns and scalds of the first and second degree, as is the application or submersion of the parts in very cold water. The following mixture will also prove of benefit:

℞.
    Cider Vinegar ....
    Glycerine, āā .... ℥ ij
    Bismuth Subnitrate, q. s. to form a thin paste.
    Sig.—Paint over the inflamed surfaces every two or three
    hours.

A mixture that will give prompt relief in inflammatory conditions of the skin, attended with itching and soreness of the parts such as is experienced in acute eczematous states is composed of the following agents:

℞.
    Oxide Zinc .... ℥ ij
    Carbolic Acid .... ℥ ss
    Witch Hazel .... ℥ iij
    Aqua, q. s. ....fl. O j
    M. Sig.—Use as a wash to the affected parts.

The application of cooling lotions to inflamed surfaces with the atomizer is both soothing and comforting, where the arterial tension is great and burning pain is a feature. Fanning the part after wetting it with the cooling lotion will act in a like manner.

A serviceable application to inflamed parts resulting from prolonged pressure that is likely to suppurate or slough is composed of the following ingredients:

℞.
    Alum .... ℥ ij
    Alcohol .... ℥ xij
    Water, q. s. ....fl. O j
    M. Sig.—Bathe the inflamed parts every two or three hours.

The alkaline solution as a local application is most serviceable in all inflammations resulting from bites and stings, especially such as are produced by poisonous snakes and rabid animals. In such cases the above topical application should be supported by immediately administering in and beneath the wound a half drachm or more of a two per cent solution of permanganate of potash hypodermically. After the lapse of an hour or more after the reception of the wound nitrate of strychnia, adrenalin chloride, or brandy should be administered, as the poison has by this time been absorbed and its lethal effect upon the system must be overcome by stimulation.

The local inflammatory effect of the poison ivy and oak is best subdued with the menthol solution sprayed upon the irritated area with an atomizer also to relieve the itching that is characteristic of the attack. A teaspoonful of concentrated lye dissolved in a pint of water and used as a wash to the inflamed area at the first appearance of the vesicles will be found most efficient to control both the itching and the hyperemic condition of the skin. Phenic acid quickly brushed over the vesicated area, followed by bathing the part with alcohol, will prove most gratifying in these cases. The procedure may have to be repeated two or three times in the worst phases of the attack, with intervals of a day or two.

The same local application will be found most efficient in the early stages of erysipelas, as will painting the inflamed area with full strength veratrum every three or four hours. In cases where this agent seems to be too stimulating a twenty per cent solution of witch hazel in water should be substituted for two or three days with a few drops of phenic acid added. Antiphlogistine is highly praised by some medical practitioners in the treatment of erysipelatous, as well as other forms of inflammation, but it, with other pasty mixtures, confines the heat to the already super-heated area, thus having a tendency to intensify the disease rather than to relieve it.

Inflamed surfaces resulting from excoriation or scratching with the finger nails should be washed occasionally with a two per cent borax solution (ten grains to the ounce of water) dried with a soft cloth and dusted with finely powdered white lead; if this is properly done no other treatment will be required.

Local inflammatory conditions caused by caustic potash, ammonia, and other alkaline irritants, should be bathed with weak acidulated water, or dressed with the vinegar and bismuth mixture as often as the nature of the case demands while the same morbid state, when produced by strong acids, should be bathed in borax water and dressed with the alkaline mixture, the latter agent made somewhat stronger by the addition of a little more salicylic acid constitutes a most potent mixture in the treatment of such inflammatory states of the skin as are threatened with suppuration and gangrene.

Tubercular and syphilitic inflammations of the skin demand the most persistent antiseptic treatment to subdue the activities of the morbid action. The alkaline solution will be especially efficient in cases due to syphilitic invasion, but may have to be increased in strength to meet the worst phases of the disease. If the surface of the skin is abraded and shows a tendency to ulceration, cleanse the part with antiseptics and follow with a dusting of biborate of soda twice a day.

Tubercular disease of the skin is not common, and when met with is usually found to be associated with lesions of the same nature located in other parts of the body; hence to successfully treat the external phases of the disease much reliance must of necessity be placed upon indicated remedies taken internally. A most potent application for relief of the external inflammatory lesion is composed of salicylic acid, grains thirty, glycerine one ounce, dissolved by heat and applied to the affected area three or four times a day. Not infrequently the tubercular masses, however small they may be, must be removed with the sharp curette before the local disturbance can be subdued.

Salves and other greasy mixtures seldom find a place in the successful treatment of any form of acute inflammatory diseases of the skin. They are smeary in their nature and occlude the pores in the integument, thereby favoring the retention of heat rather than reducing it.

Little can be said in favor of fomentations and poultices as a local dressing in the treatment of superficial inflammation, except in such cases where suppuration is imminent and it is desired to hurry the abscess formation to a head. Here a fomenta-

tion made from equal parts of hops and stramonium leaves, moistened with hot water, serves a good purpose. Poultices made from flaxseed or powdered slippery elm bark are both comforting and curative and can be applied with every assurance of relief from the burning pain experienced in the worst phases of the morbid state.

There are a number of medicinal agents that, taken internally, in accordance with specific indications, favorably influence the skin, when any considerable part of its surface suffers inflammatory changes.

At the outset the treatment of acute inflammatory diseases should be commenced by opening the bowels with some one of the saline purgatives, and the function of the kidneys should be stimulated with acetate or citrate of potash in small but frequent doses.

Of the sedative agents in repute in this form of disease, aconite, veratrum and gelsemium can be most favorably mentioned. To obtain the best results from their administration, each must be given in accordance with the specific indications for the drug.

Aconite should be given in those acute cases showing a bright red surface, high fever, quick corded pulse and capillary stasis.

Veratrum is the sedative agent in asthenic conditions indicated by a full bounding pulse, the surface flushed a deep red, and the tissues showing a marked fullness. It is especially to be thought of in erysipelatous inflammations.

Gelsemium is the remedy to control nervous irritation, nervousness, fever high, flushed face, contracted pupils, with marked local congestion of the inflamed part. This remedy is usually associated with aconite in acute cases with excellent results, with the above indications present.

Echinacea should be the first remedy thought of in cases of inflammation aggravated by local infection. It can be associated with either aconite or veratrum. Baptisia is also a potent remedy that should be thought of in connection with such cases, as well as sulphurous or hydrochloric acid diluted with water, where the tongue is red, breath offensive, with marked digestive derangements.

Rhus tox has a place in the treatment of inflammatory skin disease, especially in children and delicate females with thin skin, light hair and blue eyes. The indications for its use are a marked burning pain in the part affected, with a tendency to vesicate; prominent papillæ showing on a rather pointed tongue usually free from coating. With the above conditions the pulse is quick and sharp, accompained with frontal headache.

Guaiacol carbonate, when painted over inflamed surfaces, especially when accompained with excessive heat, as is often observed in erysipelas, rapidly subdues the hyperpyrexia and lessens the local congestion. This potent agent is of great value in the treatment of tubercular diseases of the skin, especially in the early stages. At the same time the drug can be given internally in increasing doses one hour after meals, commencing with three drops, adding one drop to each succeeding daily dose until fifteen or twenty drops are taken during the day. It should be taken in capsules with water, or in wine or brandy.

Salo sedatus, one of the coal tar mixtures, is one of the most reliable remedies at our command to reduce high temperatures, hence it should find a place in the treatment of erysipelatous inflammations as an internal medicament. Given in from five to ten grain doses with water every three or four hours, the temperature will come down, the burning pain will be relieved, and rest and sleep will be secured. The drug should not be given with a temperature below one hundred.

The local treatment of lesions of the skin, when produce by syphilitic invasion of the general system, will be greatly aided by the internal administration of phytolacca, trifolium and corydalis taken in liberal doses in the early stages of the skin lesion, but when the disease is well advanced more reliance can be placed in Fowler's and Donovan's solution of arsenic, iodide potassium and some of the compound mixtures of these medicinal agents. One of the most reliable compounds to administer for the skin lesion is the following:

℞.
Spc. Tr. Phytolacca .... ℥ ij
Iodide Potassium .... ℥ ij
Syrup Trifolium Compound, q. s. ....fl. ℥ vj

M. Sig.—A teaspoonful every three hours during the day.

Where the general system is poorly nourished, appetite variable, and where anæmic conditions exist, such tonic and stimulating remedies as acid solution of iron, strychnia, the lime salts, arsenic and the specific tr. of phosphorus should be administered in alternation and in such doses as the individual case requires.

The diet of a patient suffering from external inflammation should be carefully regulated. Usually milk, gruel, rich soups, custards and jellies are taken with a relish. In feverish states ice cream, lemon and pineapple ice are craved and are admissible if taken with graham crackers, or very plain sponge cake. Buttermilk and koumiss are nourishing and so are the juices of fruit. Eggs can be eaten with moderation and well-cooked fowl and tender meats can be partaken of, if not contra-indicated by digestive disturbances.

BOILS

A boil may be described as an inflamed tumor, assuming the character of an abscess.

It is usually due to some functional wrong of the system, resulting from uncleanliness or digestive disturbances, and the clogging of the emunctories of the body.

The systemic taint may be so pronounced as to give rise to a "crop" of boils, the severity of which may seriously impress the patient.

It is thought by some that boils frequent regions that are subject to continued irritation; to a certain extent this may be true; nevertheless, the painful tumor locates itself where it is least expected.

At the outset the treatment will be chiefly local. To subdue the inflammatory action, thereby aborting the commencing boil, use the following:

℞.
    Spec. Tr. Veratrum Ver. ....
    Spec. Tr. Belladonna, āā .... ℥ j
    Glycerine ....fl. ℥ ij
  M. Sig.—Apply to the inflamed area on an absorbent cotton
    compress every two hours, and bandage when practicable;
    otherwise paint the part every hour.

8

Should this course prove ineffectual, suppuration may be hurriedly brought about by the application of poultices of flaxseed or stramonium leaves and hops steeped in vinegar, one part, water five parts, or what is better, an absorbent cotton compress wet in the alkaline solution; the latter is especially valuable when infection in any case is pronounced. The external application of tincture of iodine, used early, will often abort a boil and the introduction of two or three drops of pure carbolic acid in the center of the tumor will prove beneficial when well advanced.

CARBUNCLE

Carbuncle, it may be said, is but an aggravated boil. The painful tumor has at least all the characteristics of a boil, differing with it, perhaps, in the feature of its more profound systemic impression, and its tendency to convert a greater amount of adjacent tissue into a suppurating mass. The tendency to discharge pus through several openings is also a feature quite unlike that of a boil.

People living in hot, moist climates, and feeding on meats and fish, oysters and clams, as well as those who are subjected to great mental strain, are prone to this disease, it proving very fatal in elderly people and those feebly inclined.

The back and cervical regions are especially liable to attacks of the disease, as are the nates and forearms. However, like furuncles, no region is exempt from their invasion.

Treatment: The treatment must be of a supporting nature. Here marked symptoms must dictate the remedies, which will be antiseptics, tonics and stimulants, and the most nourishing food the stomach will digest and assimilate.

The topical applications advised in the treatment of boils will be applicable in carbuncle. Except in the enfeebled, it is advisable to make a deep crucial incision early in the tumefaction, after which apply compresses wet with antiseptic solutions.

In persons of feeble habit extensive incisions in the developing mass is contraindicated, sloughing and gangrene being likely to result. Here it is advisable to cut through skin and fascia, inject a drop or two of pure carbolic acid superficially

in two or three different sections of the mass with a hypodermic syringe, and irrigate frequently with some good antiseptic fluid. Should gangrene attack the sloughing mass, use freely of pyrozone and the alkaline antiseptic for a dressing. The dressing should be kept wet with the solution. In enfeebled persons the system should be toned up by giving three-drop doses of Howe's acid solution of iron every three hours, alternated with teaspoonful doses of the following mixture:

℞.
  Fowler's Solution .... ℨ i
  Elixir of the Glycero-phosphate of Lime and Soda, q.s. fl. ℨ vi
  M. Sig.—As above directed.

CLAVUS—CORN

A corn is a local thickening of the skin and subjacent tissue from the center of which, a horny layer or projection, dips downward through the hypertrophied mass, pressing upon the underlying sensitive tissue, provoking a painful, inflammatory state of the part. A soft corn is one macerated by moisture, as by perspiration, and is usually found between the toes.

Pressure or friction of a part produces these hypertrophies on the toes or a prominent joint of the foot, generally by an ill-fitting shoe.

Owing to the fact that these morbid growths become intensely tender and painful during changeable weather, accounted for by their hygroscopic qualities. they have been termed "human barometers."

To be successful in removing these extremely painful indurations, the exciting cause, the pressing or friction medium, should be first removed; this being done, and the corn soaked in glycerine and water, equal parts, as hot as can be borne, several times a day, will soon cause the corn to disappear. It might be well to carefully paint the corn two or three times with lunar caustic, or glacial acetic acid, which will produce a hard crust in a day or two, that can be removed by paring or peeling it off; after which apply to the morbid mass once or twice a day with a camel's hair pencil, a drop or two of the following mixture:

℞.
   Salicylic Acid .... ℥j
   Cocaine .... gr. v
   Ext. Cannabis Indica .... gr. xv
   Collodion ....fl. ℥j
M. Sig.—Apply locally to the corn.

The tender and inflamed state accompanying a corn can be greatly relieved by painting the part with the tincture of iodine once or twice a day, or applying spirits of camphor or turpentine.

INGROWING TOE NAIL

The edges of the nails of the great toes are prone to become incurved and buried in the tissues, as a result of wearing tight and narrow shoes and improperly cutting the nails. One or both sides of the toes may be affected at the same time, the condition being that of acute inflammation, which is often accompanied with painful ulceration. The pain and distress experienced in walking is often extremely severe. The treatment of ingrowing toe nails is by medical and surgical methods.

Treatment: In mild cases, the inflamed tissue may be touched with pure phenic acid, followed immediately with alcohol, or the inflamed parts may be treated with a saturated solution of copper sulph. This treatment is especially beneficial, where a tendency to ulceration exists, and in connection, small bits of lint or cotton should be wet with the alkaline solution and placed between the nail and the morbid tissue; at the outset, that part of the nail found pressing into the tissue, should be removed with scissors, if possible, and later the nail should be so trimmed as to prevent the edges from again growing into the soft parts; all pressure should be avoided by wearing wide soled boots or shoes.

In aggravated cases, portions, if not all of the nail, should be removed; this is done under cocaine anæsthesia with a rubber band tightly adjusted around the base of the toe to prevent hemorrhage. A four per cent solution of cocaine is injected at the base and around the nail with a hypodermic needle, and as soon as the tissues are properly cocainized, the nail is loosened from its under tissue with a bistoury, split down one or both

sides and the buried portion or portions removed with forceps. If the toe is seriously infected and it is thought best to remove the entire nail, it should be split down the middle and each lateral half seized with forceps and pulled out. The raw and ulcerated surfaces are then touched with phenic acid and the toe dressed with sterile gauze, wet with some potent antiseptic solution. If the matrix be cauterized with pure phenic acid, the new nail will come in more stubbed in form and not likely to extend into the flesh at the sides of the toe. There are several other methods in vogue for the surgical treatment of ingrowing nails, but none that is likely to give better results than will be obtained if the above methods are followed.

FELON—PARONYCHIA—WHITLOW

A felon is a painful inflammatory affection of the fingers and toes in which the periosteum is often involved. The morbid state usually terminates in suppuration and abscess formations. It has an infectious origin, usually following some slight traumatism, as the prick of a pin or sliver, or some slight wound received while operating or in dissection.

When the suppurative process takes place near the surface of the finger the morbid state takes on something of the nature of a boil, which soon heals after the evacuation of the pus, without seriously complicating the deeper structures of the finger. The results are quite different in the periosteal form of the affection; in this form of felon the attack is usually on the terminal phalanx, and the periosteal complication is secondary in character, but may be so grave that suppuration rapidly supervenes, and often results in necrosis of the bony structure. This form of felon is determined from the superficial variety by the greater length of time required for the pus to point on the surface of the finger, and the intensity of the pain, which is throbbing in character.

Treatment. The treatment of felon, if the nature of the affection is determined early, is by immersing the affected part in quite hot solution of the alkaline mixture, frequently referred to in the treatment of infectious troubles. The bath

should be for a period of thirty minutes, the solution kept at a
moderate heat during this time, and repeated three or four
times a day; following the bath the infected area should be
painted with equal parts of veratrum and belladonna; after
subjecting the morbid state to this form of treatment for two
or three days without any relief, the inflamed part should be
laid open by a deep incision reaching the periosteum, subse-
quently the traumatism is dressed with antiseptic washes and
bandaged, keeping the hand elevated to lessen the throbbing
pain.

ULCERS

An ulcer may be described as a suppurating, open sore,
involving the skin and adjacent tissue, and may be the result
of traumatism, or a morbid state of the body, local or general in
character.

For descriptive convenience, the disease may be divided into
the simple, chronic and infectious varieties. The simple form of
ulcer usually results from local injury to the skin or the mucous
membrane which undergoes some degree of inflammatory action.

Treatment consists in reducing inflammation, cleansing the
abraded surface with frequent applications of antiseptic washes,
and strapping with narrow strips of oxide of zinc plaster, or run-
ning on a light gauze bandage, when the location of the ulcer will
admit of it being done.

The chronic ulcer is met with in the enfeebled and poorly
nourished.

It may have had its inception in the simple ulcer and is
but an aggravated condition of this form. The legs and arms are
subject to the chronic ulcer, especially the tubercular and eczema-
tous type of the disease. Œdema, thickened and indurated
edges, and a purplish red discoloration of the surrounding parts
will distinguish this ulcer from the simple form.

In a measure, the treatment advised in the simple form will
be of use here; in addition, the general health will need attention.
Any functional wrong, as indigestion, constipation, poor circu-
lation and enfeebled action of the skin and kidneys, must be cor-
rected before efforts at healing will accomplish much.

The ulcer presenting much callous or unhealthy granulating tissue, will be put in a condition to heal by efficient curettement, followed by frequent dressings with a two per cent solution of permanganate of potash or the same strength of creolin, in foul and in non-inflamed conditions.

Boric acid solution, two per cent in strength, or the alkaline mixture will be efficient in inflamed cases, or complications likely to result in destruction of tissue. This treatment, if applied with care, will be invaluable in eczematous ulcers, bearing in mind that edematous states of the parts require strapping or bandaging and the assuming of positions favorable to a return to normal condtions.

The characteristics of the infectious or venereal ulcer are its ragged and undetermined edges; grayish slough instead of granulations, and discharging a virus that is highly infectious, producing ulcerative sores wherever it comes in contact with mucous surfaces.

There are two varieties of this sore, hard and soft ulcer, or chancre, both producing local effects, and one constitutional. The hard chancre is an indurated sore, and appears singly at the point of contact; the other form manifests itself in as many sores as there have been inoculations.

The treatment of this form is that given in simple ulcer, with the further application of some active agent that will destroy the infective virus. There are several escharotic agents of value here. After cleansing and drying the sore, sprinkle on its surface, lightly, biborate of soda, repeating the application every three hours, or apply frequently the following:

℞.
    Biborate of Soda .... ℥ iij
    Salicylic Acid .... ℥ i
    Glycerine ....fl. ℥ ij
M.

Or:

℞.
    Sulph. of Copper .... ℥ i
    Aqua Dest. ....fl. ℥ ii
    M. Sig.—Apply to the ulcer   · day.·

Occasionally, at the   ch the ulcer

with the copper pencil once a day. Seldom, if ever, is it necessary to resort to the use of silver nitrate, or nitric acid.

To modify the systemic taint, remedial agents known to be antisyphilitic and alterative in their effect, must be resorted to; indeed, without their modifying influence in many cases of infectious ulcer, little can be accomplished with local applications. The following agents can be relied on to aid in a cure:

R.
  Iodide of Potash .... ℥ j
  Spc. Tr. of Phytolacca .... ℥ ss
  Aqua Dest., q. s. .... fl. ℥ ij

M. Sig.—Ten to fifteen drops in water, repeated every three hours.

Or:

  Iodide of Potassium .... ℥ ij
  Syrup of Trifolium Comp. .... fl. ℥ vi

M. Sig.—A teaspoonful every three hours.

The proto-iodide of mercury in one-tenth grain doses, given in pill or tablet triturate every four hours, will prove efficient in cases of long standing, taken in alternation, with the first formula given above. An occasional dose of some saline laxative to keep the bowels open, will assist the action of other medicinal agents.

Special attention must be given to the care of the body. The function of the skin should be kept active by frequent bathing in borax or salt water, followed by brisk friction. The diet should be composed of rich viands that **tickle** the palate and otherwise appeal to a changeable appetite. Fresh and suitable exercise must not be neglected.

X-RAY BURNS

Serious affections of the skin and subjacent tissue, partaking somewhat of the nature of a burn, frequently follow the exposure of the part to the application of the ray. The danger seems to arise from too long a period of application, as well as too frequent exposures; and the wonder is that serious injuries are not more frequently inflicted with the potent agent, espec-

ially when it is applied by so many practitioners and others who know but little of its powerful action on the tissues.

A burn produced by the X-ray heals very slowly, is usually very sensitive to the touch, frequently sloughs, and has been known to so severely shock the system that death ensued. Some persons are more susceptible to the influence of the ray than others, and the operator should limit the application of the agent to a period of three to five minutes at the outset, that its effect on the patient may be observed. An exposure is usually limited to thirty minutes, more often a ten minute exposure is all-sufficient. A deceiving feature in the use of the Roentgen (X-ray), is that the operator does not know what harm he is doing with the force until after it is done.

The symptoms attending burns of this nature are heat, pain, redness and often extreme irritation of the part; together with breaking down and sloughing in extreme cases. The ulceration following the burning is slow to yield to treatment.

Treatment: The treatment should be supportive from the first; applications of a solution of biborate of soda, or the alkaline mixture, recommended in the treatment of burns and scalds will be of benefit here. During the inflammatory stage, give the specific tincture of echafolta and gelsemium, to prevent sepsis and to control nervous irritability. Other conditions should be treated as they arise. In cases where the skin is hyperemic and parchment-like, topical applications of unguentine, carbolated vaseline or cold cream, in which orthoform is incorporated, will prove of much benefit. In advanced cases of ulceration, with no disposition to heal, amputation is often necessary.

VERRUCA—WART

A wart is a common excresence, appearing on the surface of the skin. It is due to a papillary hypertrophy.

There are two varieties worthy of mention; the common and the venereal. The common warts usually seen on the hands, arms, neck and face, vary in size from a pea, to that of several lines in length and thickness. The surface may be smooth or rough, round or flat.

The venereal wart, varying in size from a pin head to that of a marble, results from infectious micro-organisms. The genital region is usually the part that suffers an attack from this form of the growth. They ofttimes appear in vast numbers, are soft, and pinkish in color, emitting a very disagreeable odor, which results from an oozing of a semi-purulent exudation.

Treatment: In applying treatment to a wart, if of the first form, touch it once every day or two with a wooden toothpick, dipped in glacial acetic acid, or until the part becomes quite irritated; wait two or three days, and if necessary repeat. Nitric acid used in the same way, is efficient, but severe. An excellent mixture for "seed" warts is the following applied three times a day:

R.
    Salicylic Acid .... ℥ ij
    Glycerine ....
    Olive Oil, āā .... ℥ j
M. Sig.—Apply to the wart three times a day.

Or:

R.
    Salicylic Acid .... ℥ j
    Collodion .... ℥ j
M. Sig.—Apply same as the other.

The region attacked with venereal warts should be bathed daily with a solution of borate of soda, one ounce to a half gallon of water, after which dry and dust the parts with boracic acid three times a day or as often with:

R.
    Salicylic Acid .... ℥ ij
    Borax .... ℥ iv
M. Sig.—Dust the affected part three times a day.

This mixture is quite moist at first, but will dry if exposed in a mortar for a little time.

The dusting on of calomel is efficient in obstinate cases; use morning and evening.

Snip off with scissors long slender warts and touch the bleeding surface with caustic potash.

SEBACEOUS CYSTS

These cystic formations are quite common on the scalp, but may be found upon other portions of the system, especially

the back. They are observed as soft, smooth bodies, situated beneath the skin and are quite movable. They contain a greasy, cream-like substance, surrounded by a secreting membrane. They vary in size from a pea to that of a small egg. The development is slow and free from pain, unless the tumor is situated where it is constantly subjected to pressure. The contents are free from purulent matter, unless the overlying skin becomes broken, permitting entrance of septic germs, when the thick, creamy secretion rapidly liquefies into a foul-smelling purulent fluid, and the cyst not infrequently degenerates into an exuberant ulcer.

Treatment: The treatment generally followed for the cure of sebaceous cysts, is the incision of the integument and the enucleation of the entire mass, including the secreting membrane: if the latter is not removed, the cyst is very apt to refill.

If any given case is presented to the surgeon in an ulcerated state, the contents should be curetted out, the cavity cauterized with pure carbolic acid, then packed for a day with iodoform or sterile gauze and subsequently dressed antiseptically.

DERMOID CYSTS

A dermoid cyst is a morbid growth containing a turbid or milky fluid, in which may be found floating detached hair, epithelium, flakes of fatty matter and crystals of cholesterin. In addition to the extraneous matter just mentioned, the walls of dermoid cysts of the ovary often contain remnants of teeth, nails, skin, and certain other parts of the body, together with a greater or less amount of loose epithelium.

The ovarian dermoid is of a rather slow growth, painful at times from pressure, and usually has quite a range of mobility.

Dermoid cysts are not infrequently found along the spine and perineal region, where the cutaneous surfaces coalesce during early embryonic existence. So normally formed is the integument in some cases of this variety of dermoid cysts, that portions of it have been removed and applied as grafts to ulcerated surfaces where they united, promptly forming new skin that showed the same form of cutaneous structure as the skin surrounding the ulcer.

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It has been observed by surgeons of note that superficial dermoids have been the starting point of malignant growths that develop rapidly in many cases.

These morbid growths can not be destroyed by medicinal treatment, but should be removed by operative measures as soon as the nature of the tumor has been determined. Great care should be exercised when executing the work not to leave any part of the lining of the cyst-wall behind, otherwise the growth is very apt to return.

The operative work should be done under strict antiseptic technic and the after treatment should consist of such measures as will insure a speedy recovery.

KELOID (ADDISON)

Keloid are hypertrophies or multiple formation of skin-tumors springing from scar tissue or resulting inflammatory action. Scars following burns and those resulting from constitutional ailments as syphilis and lupus are prone to be followed by these morbid growths.

The chest, shoulders and neck, are favorite locations for keloid tumors, the colored races seemingly being more prone to the affection than the white race, and persons of middle-age are more liable to attacks of the morbid disease than are children and the aged.

The hypertrophied tissue is dense and of slow growth, having no tendency to ulceration. It is prone to return if removed by excision from the scar of wounds; cases have been known to spontaneously disappear without any form of treatment. There are no pronounced symptoms during the development of these growths, other than a little twinge of pain in cases where one or more filaments of nerves are involved in the growths.

Many medical agents, singly and in combination, have been used topically in efforts to remove these dense growths with various degrees of success. If used early the lead plaster or a saturated solution of iodide of potassium applied locally has a tendency to absorb or will at least retard the growth of the tumefied mass. The following formula has proven effectual in many cases:

℞.
    Salicylic acid .... ℥ ss
    Ext. belladonna .... ℥ ij
M. Sig.—Use topically on the growth two or three times a
day.

Internally, spec. tr. phytolacca and echinacca or iodide of potassium in syrup of trifolium compound will be of much benefit.

Excising the morbid mass has not met with the radical success expected of the procedure; in most cases the growths return, especially when they originate in large scar areas. Caustics usually prove futile and electrolysis accomplishes little lasting good.

TRUE KELOID

Keloid is an affection of the skin, the chief characteristic feature of which, is dense elevations or tumors, composed mostly of fibrous tissue. The morbid condition is generally observed in the scar tissue of a wound or burn, but does not make its appearance until some little time after the traumatism has healed. When the growth first makes its appearance it is quite vascular, but as it increases in size, it loses its vascularity, when it becomes hard and scaly, unless it degenerates into a softer growth, similar to a sarcoma, which it sometimes does.

It is a disease of adult life and is observed more frequently in the colored race than in the white.

There are no characteristic symptoms to distinguish this morbid state of the skin, other than the fibrous-like growths, previously referred to, except in such cases as may involve some nerve filament, when there will be more or less pain experienced in and around the growths.

Treatment: The treatment of keloid has, in the past, consisted of the application of various mixtures of medicinal agents, together with the use of electricity, to absorb the developing growth, with but little or no success. During the early stages of its development, much benefit may be derived from the following mixture:

℞.
    Salicylic Acid .... gr. xx
    Resorcin .... gr. xv
    Glycerine .... ℥ ss

M. Sig.—Apply to the exuberant tissue two or three times a
day.

If the above mixture fails to reduce the cicatricial growth
within a reasonable time, it should be excised, care being exer-
cised to dress the wound in such a way that a very small scar
will be left to prevent, if possible, a return of the affection.

SKIN GRAFTING

Skin grafting is resorted to where extensive portions of the
integument are destroyed by ulceration, traumatism, scalds and
burns, where the space is too great for the edges of the skin
to span. From the foregoing it is seen that the operative pro-
cedure has an extensive range of possibilities.

When left to nature's effort to heal, ulceration and other
wounds of long standing, often close wholly, or in part, with
cicatricial contraction, that not infrequently results in deformity.

Plastic operations to replace a portion of a lip that has been
lost or to form an artificial nose, may require the aid of skin
grafts to close the denuded chasm and to prevent undue contrac-
tion of tissue involved.

To insure a successful planting of the grafts, whether large
or small, the surface of the wound must be in a healthy state,
free from discharges and inflammatory action. A too active
state of a granulating surface is not favorable to the taking of
skin grafts.

The technique of the operative work should be perfect. The
wound surface must be freed from excess of moisture, and the
area from which the grafts are taken should be thoroughly
sterilized, as well as the instruments and dressings. If the de-
nuded surface be small, few grafts will be needed and these
should consist of small particles of the epithelial and Malpi-
ghian layers of the integument, picked up with small toothed
forceps and snipped off with scissors. These small grafts should
be placed equidistant over the surface of the wound with the
raw surface downward and held in place with gutta-percha
tissue, previously rendered sterile by washing in carbolized
water and then in normal salt solution, over which a gauze
bandage is adjusted.

To successfully treat large denuded surfaces, compresses wet with sterile normal salt solution should be kept in contact with the open wound a few hours previous to placing the skin grafts. Thiersch's method, which is recommended, is to shave strips of the outer layers of skin of the desired width and length from a previously sterilized area of the arm or thigh, with a keen cutting razor and adjusting them to the surface of the wound till all is covered in. Previous to planting the strips of cuticle, the granulations, if active, should be lightly curetted and all hemorrhage checked by pressure with gauze pads wet in normal saline solution. To hold the grafts in place, narrow overlapping strips of rubber tissue are first adjusted over which, gauze bandages are applied. The first week or ten days following the planting of the grafts, the wound should be wet with normal saline solution; at the expiration of this time, the first redressing should be done, and should be repeated every two or three days thereafter, until the healing process is complete: antiseptic precautions being taken at all times to prevent infection.

The raw surfaces, from which the grafts were removed, should be dressed aseptically and kept covered in by bandaging till well.

The instruments required in the operative work are a needle in a holder, small dressing forceps, scalpel, scissors and razor.

HERPES

This form of skin disease is characterized by a grouping of small vesicles upon reddened bases, and is usually found on the lips, cheeks, sides and on the prepuce.

The disease may result from nervous shock through traumatism, though ordinarily it is produced by taking cold; and not infrequently it follows active acute diseases, as pneumonia, intermittent and typhoid fever, gastro-intestinal disturbances and rheumatism.

The prominent symptoms accompanying this affection are slight chills, fever, headache, thirst, restlessness, and in cases of herpes zoster, or shingles, severe burning pain. A diagnostic

feature of zoster is its cluster of vesicles upon one side of the chest at a time; usually about the waist line.

The early phases of the disease can soon be relieved with the following mixture:

R.
    Spec. Tr. Aconite .... gtts. x
    Spec. Tr. Rhus. Tox .... gtts. xv
    Spec. Tr. Phytolacca .... gtts. xx
    Aqua Dest. ....fl. ℥ iv
M. Sig.—A teaspoonful every two hours.

Alternate with an acid or an alkali, as the tongue will indicate, in herpes zoster and other severe forms of the disease.
, Restlessness and severe painful states will call for anodynes. The following mixture will bring relief here:

R.
    Bromide of Soda ....
    Chloral Hydrate, āā .... ℥ ij
    Simple Syrup .... ℥ iij
M. Sig.—A teaspoonful every three or four hours.

As a local application to vesicular eruptions, nothing excels the application of phenic acid on a cotton applicator, quickly followed by a swabbing with alcohol. This method is especially useful in herpes zoster; following the application of the acid, the parts should be dusted with finely powdered calamine two or three times a day.

A solution of sulphate of copper, a drachm to the ounce of water, is also a valuable astringent wash for the eruptive parts; it should be applied once or twice a day.

,Herpes circinatus, or ring-worm, will readily yield to the treatment advised for herpes zoster.

A dusting powder useful in painful states of herpes is composed of the following agents:

R.
    Heroin .... grs. x
    Pulv. Camphor .... ℥ ss
    Oxide of Zinc .... ℥ ij
M. Sig.—Dust on eruptive parts every three hours.

URTICARIA—HIVES

Hives is an inflammatory affection of the skin, characterized by intense itching, at times paroxysmal, with the appear-

ance of pinkish white blotches or wheals, over the affected area of the system. The morbid state is truly an external evidence of some constitutional taint that results from gastro-intestinal wrong, caused from eating or drinking fluids and food slow of digestion and assimilation. Strawberries, nuts and shell-fish provoke the systemic disturbance in some, while certain drugs also have the reputation of exciting the itching blotches to the skin's surface.

The eruptive stage usually appears suddenly, the inflammatory state of the skin seems latent in character, but readily "fanned to a flame" by efforts to relieve the intense itching, by rubbing and scratching. The skin is puffy and exceedingly sensitive to the touch.

The outset of the disease is usually attended with some febrile action, and gastric irritation, manifested by nausea and vomiting; and nearly all cases with more or less epigastric tenderness and pain. This phase of the disease presents where there is a retrocession of the eruption, or it is slow in coming to the surface.

Ordinarily, cases of urticaria run a short course, usually subsiding in a week or ten days. Obstinate cases are occasionally met with, however, that will tax to the limit the therapeutic skill of the surgeon, and may extend over a varied course of several months.

Treatment: The usual severity of the attack demands active treatment from the first. The bowels should be moved by some one of the magnesia salts, and a general bath in borate of soda water, after which, cotton or linen should be worn next to the skin. To subdue the febrile condition, the following mixture should be given:

R.
  Spec. Tr. Aconite .... gtts. x
  Spec. Tr. Gelsemium .... gtts. xv
  Spec. Tr. Apis Mel. .... gtts. x
  Camphor Water ....fl. ℥ iv

M. Sig.—A teaspoonful every hour.

In alternation give teaspoonful doses of a solution of Sulph. of magnesia.

℞.
   Sulph of Magnesia .... ℥ j
   Spec. Tr. Ipecac .... gtts. v
   Peppermint Water .... fl. ℥ iv
M.

In a case of hives presenting a heavy coated tongue, full stomach, with a sluggish circulation of blood, no treatment will start the patient on the road to recovery so quickly as an emetic.

To relieve the intense pruritis, many medicinal agents are in repute; a solution, which, if applied with a soft cloth or sponge to the itching parts, will be found efficient, is prepared as follows:

℞.
   Menthol Crystals .... gr. xv
   Chloral Hydrate .... ℥ vi
   Chloride of Sodium .... ℥ ss
   Aqua Dest. .... fl. O j

M. Sig.—For external application, use as often as needed. The same can be sprayed on affected parts with great relief.

In severe cases, where the wheals come out in splotches, prompt relief is obtained by swabbing over the itching area, pure phenic acid on a cotton batting applicator, quickly followed by a mop soaked in alcohol. The procedure may be repeated, care being taken not to blister the part attacked.

The patient should be put on a diet of rice, custards, tapioca, corn starch, soups, and the coarse cereals with plenty of pure water as a drink.

ACNE

Acne is an inflammatory disease of the sebaceous glands of the skin, giving rise to indurated patches upon which appear numerous hard papules or pustules. The upper part of the chest, the nose, the shoulders and the sides of the face are favorite sites for the disease to manifest itself.

Some writers divide the disease into three and others into five or more classes, being guided by the predominating symptoms in each individual case. Two classes only will be considered here, acne indurata and rosacea. The former is characterized by pustules that spring from a hard base, are usually deepseated and painful on pressure. The latter is characterized

by the pustular eruption appearing on the red and hypertrophied tissue surface; the acne lesions appearing secondary to the reddened surface of the affected area.

The skin of the affected area is usually thickened and the sebaceous follicles enlarged and exude a considerable amount of greasy substance that soon forms scales upon the surface. Blackheads, or comedones, is a coexisting affection that often intensifies the acne lesion.

The papules or pustules are not large, usually about the size of a large pin head; they remain a few days, rupture, and finally heal, leaving a little blemish of more or less red color. One crop of pustules gradually succeeds another, month after month, till the affected area is badly scarred up.

This morbid condition of the skin is commonly met with in early adult life, and may be due to any one of several causes. Digestive disorders are a common cause, so is constipation; eating too freely of candy and rich pastries will bring on attacks of acne in some persons after a little time. Menstrual irregularities and uterine disease may be the exciting causes with females, while the abuse of the sexual passion may cause the morbid state in boys and young men.

Acne eruptions have been known to follow fevers and other exhaustive diseases that impoverish the system. The long continued use of the iodides will bring on a crop of eruptions akin to acne, so will the bromides, and the external use of tar ointment. The symptoms, in severity, are hardly in keeping with the macroscopical appearance of the affection. There is very little itching and burning in the affected parts, but there is tenderness upon pressure or rubbing over the indurated area.

Treatment: The treatment of acne, in the majority of cases, requires both local and general measures, especially where the local disease can be traced to some constitutional taint. Of the first importance is the determining of the exciting cause, which then must be removed, if possible. Dyspeptic troubles will require changes in diet perhaps, constipation will most likely be helped by this, but in connection mild laxatives should be taken often enough to insure regular bowel movements. An occasional enema of glycerine and warm water or olive oil will materially aid in overcoming the sluggish action of the bowels.

The laxitive mineral waters are of material aid in these cases.

As a potent internal medicine in pustular cases, small doses of calcium sulphide, or in the absence of this agent, ten grains of sulphur taken in a little sugar every three hours will prove of value.   In anemic cases the following compounds will be markedly beneficial:

℞.
   Mur. Tr. Iron .... ℨ ij
   Phos. Acid (Dil.) .... ℥ ss
   Syrup Simplex, q. s. ....fl. ℥ vj
M. Sig.—A teaspoonful one hour after meals.

℞.
   Fowler's Solution .... ℨ j
   Elixir Glycero Phosphate of Lime and Soda, q. s. ...fl. ℥ vj
M. Sig.—A dessertspoonful in a wineglassful of water before meals.

Will prove beneficial in cases of low vitality or strumous diathesis.

Great benefit is to be expected from the adoption of proper hygienic measures, giving the patient plenty of fresh air exercise, weak borax water baths, and in keeping regular hours.

Special attention must be paid to selecting a proper diet in cases suffering from digestive disturbances. As a rule pastries, rich and highly seasoned foods, greasy salt meats and alcoholic beverages are to be eschewed.

Much depends upon the local treatment of any of the different phases of this disease.   Many remedies have been recommend, each having some good qualities to commend it.   Cases of mild and medium degree may be cured by local treatment alone, and in the severe cases the acne may be removed for a time, although it may return from slight causes.   Internal treatment alone, seldom removes the acne.   Compounds in the form of lotions and ointments are topically applied to meet the existing requirements of each case.

In acne indurata, the pustules may be of such a character as to require puncture of each individual lesion with the point of a bistoury or a tenotome; slight hemorrhage should be encouraged, following which the affected area should be sponged with hot water for five minutes at bed time, after which the following lotion should be applied:

R.

   Potassium Sulphuret .... ʒ j
   Zinc Sulphate .... ʒ jss
   Aqua Dest. ....fl. ℥ iv

M. Sig.—Apply topically three or four times a day.

The strength of this lotion can be increased or diminished, as the case in hand may require.

If properly used it will remove nearly every case of acne, especially when the other measures mentioned are carried out.

Other formulas in favor with some surgeons in the local treatment of acne are the following:

R.

   Washed Sulphur .... ʒ iij
   Ether .... ʒ iv
   Alcohol ....fl. ℥ iiiss

M. Sig.—Apply every three hours.

R.

   Bichloride of Mercury .... gr. iv
   Alcohol .... ℥ j
   Aqua ....fl. ℥ iij

M. Sig.—Use topically to the affected area three or four times a day.

If an ointment should be desired, the following mixture will prove effectual:

R.

   Precipitated Sulphur .... ℥ j
   Benzoated Lard .... ℥ iss

M. Sig.—Use locally.

R.

   Sulphuret of Potassium (Powd.) .... ʒ j
   Benzoated Lard .... ℥ iss

M. Sig.—Apply to the eruption every three hours.

The compound can be made weaker for sensitive skins.

As stated in another part of this article, acne Rosacea differs from acne indurata only in the acne in the former phase of the disease appears upon a red and hypertrophied base, it generally manifests itself on the nose and cheeks. First the disease appears as a single hyperemia, with slight redness; later the skin becomes hypertrophied and the redness increases, minute veins appearing near the surface, and pustular acne appearing here and there over the affected area. In aggravated cases the congested blood vessels become so pronounced, the hypertrophy of the connective tissue and glands so marked, that the

morbid condition gives rise to a lobulated appearance to the affection, when located in the nose. The exciting causes of this phase of the disease are the same as were noted in acne indurata. The disease in some cases simulates lupus vulgaris and tubercular forms of syphilis.

The internal treatment of this form of the disease will not differ from that recommended in acne indurata, such remedial agents as nux vom, hydrastis, iron, sulphur, and echinacea will be suggested when their specific indications are present.

The lotions and ointments suggested as topical applications in acne indurata, will prove of much benefit in acne rosacea, except in marked cases of hypertrophied tissue or bulbous enlargement of the nose; in such cases electrolysis and surgical measures will have to be resorted to for the removal of the redundant tissue.

EMPHYSEMA

Emphysema is the presence of air or gas, abnormally, in the subcutaneous tissues. There are several varieties of the morbid condition, each having some marked characteristic to distinguish it from other forms of the ailment; chief of these is acute pulmonary emphysema, with a dilatation of air-vesicles and loss of normal elasticity of lung-substance, usually caused from wounds of the lung, resulting from a fractured rib, stab or gunshot wound. The extent of the infiltration of the tissues is very much lessened, if the external wound is allowed to remain open for a brief period of time, which may be done under favorable circumstances, if well covered with medicated gauze.

Not infrequently air escapes from the lung tissue, in advanced stages of tuberculosis, through ulcerative areas, into the subcutaneous tissues about the neck and upper part of the body, causing a marked puffiness of the external parts. To press the open hand over the skin surface, a crackling sensation is often imparted to it that is very pronounced in some cases. The most marked case of swelling of the subcutaneous tissues provokes no pain nor does it produce discoloration of the integument or pitting on pressure, as observed in edema of the tissues. Local emphysema, or where the infiltration does not

extend far beyond the circumference of the wound, is very often
met with in injuries to the lungs; the symptoms accompanying
such cases are unimportant.   The most pronounced symptoms
in grave cases of wounds of the lung is the interference with
respiration and circulation of blood throughout the thorax.

Treatment: The treatment of emphysema consists in keep-
ing the patient quiet and in bed in a partially reclining position,
with the application of such measures as will relieve distention
of the tissues and support the strength of the patient.   The
former may be accomplished by the snug adjustment of a wide
towel about the thorax or other portions of the body when
feasible.   Remaining quiet and free from excitement of every
kind will favor dissipation of the retained air in the lung tissue,
which will relieve the dyspnea and cyanosis usually observed
in marked cases of the disease.

Puncture of the skin over areas distended with air often
aids in its escape.

In the interlobular variety of the disease, besides the dis-
tressing dyspnea, there is often a troublesome collection of mu-
cus present in the bronchi and trachea, provoking a harassing
cough, and to relieve which, the following prescriptions may be
given with benefit:

R.
Spc. Tr. Lobelia .... 3 ss
Spc. Tr. Bryonia .... gtt xx
Aromatic Spts. of Ammonia .... 3 iij
Simple Elixir, q. s. .... fl. 3 iv

M.   Sig.—A small teaspoonful every hour or two, as needed.

R.
Heroin .... gr. ij
Chloroform Water .... fl. 3 iv

M.   Sig.—A teaspoonful as may be needed.

To support the strength of the patient, such medicinal
agents as Fowler's solution of arsenic, tinct. of phosphorus,
phosphoric acid (dil.), nit. of strychnia, iron, and small doses of
quinia should be given in alternation.

Other morbid states of the body accompanying this ail-
ment should be treated as they appear or as the symptomatic
indications will suggest.

ECZEMA—SALT RHEUM

This form of skin disease which constitutes so large a proportion of the affections of the integument, can be traced to several causes, chief among which are digestive disturbances. Functional irregularities and impressions made on the skin by external irritants, are common provoking causes.

There are numerous varieties of the disease mentioned by dermatologists, but usually they only serve to designate the different stages in the progress of the disease, and furnish little aid in establishing the causes leading up to the morbid state.

The early manifestations of the disease are an itching and burning of affected areas of the skin, with an eruption of small vesicles, which rupture from continuous rubbing and scratching; the sero-pus later forms crusts or scabs over the abraded surfaces.

The tendency of the disease is to extend from one part to another, the affected area drying up and healing behind the extending border of vesicles and pustules. The vesicles or pustules usually present in patches or groups, and contain serum or a thin sero-pus, during the formation of which, the itching is most intense. Marked thickening of the skin results in chronic cases, with a tendency to crack, exuding an inflammatory exudate, which soon dries, forming adhesive crusts.

In acute attacks about the head, face, and upper part of the body, there is usually some febrile disturbance manifested, and in children extreme restlessness is often a marked feature of the disease. Any part of the system is subject to an invasion of the eczematous state, although the face, breast, hands and feet, also lower limbs, are favorite locations for an attack of the disease in the adult, while with children, the buttocks, neck, face and scalp are regions most likely to be attacked. Acute eczema of the pubic and genital regions presents a most wretched form of the disease, as upon the least exertion, the parts become moist from perspiration, which causes a tenderness of the skin and intensifies the itching. A dribbling of urine in old people, and a profuse acrid leucorrheal discharge in women suffering from eczema of the genitalia also brings on an intolerable itching, difficult to endure.

Eczema often accompanies a varicose state of the veins of the lower limbs; women who have borne children, and persons whose occupations require them to stand much of the time are prone to this form of the disease.

Tinea capitis is a form of skin disease, akin to eczema, the characteristic feature of which is its tendency to attack the scalp. It is considered contagious by some, as children with whom an infected child has been associated have later broken out with the disease.

Treatment: In acute cases there will be more or less fever that will call for a febrifuge, with the other indicated remedy. Start the treatment with an active movement from the bowels by administering a saline cathartic, after which, the following mixture will be found of service:

℞.
Spec. Tr. Aconite .... gtt. v
Spec. Tr. Rhus Tox .... gtt. x
Aqua Dest. ....fl. ℥ iv
M. Sig.—A teaspoonful every hour.

Should there be glandular enlargement, add fifteen drops of the spec. tr. of phytolacca to the above mixture.

Should the patient exhibit an enfeebled state of body, the vital powers should be stimulated with peptics, and tonics. A mixture that has served well here is composed of:

℞.
Fowler's Solution .... ℥ ss
Lloyd's Hydrastis .... ℈ iij
Syrup of Lactophosphate of Lime .... ℥ iijss
M. Sig.—A teaspoonful before meals, in a half wineglassful of water.

In connection with the above prescription, the following medicinal agents will serve a good purpose, especially should the patient show a cachectic or strumous state of the system:

℞.
Spec. Tr. Echafolta .... ℥ ss
Donovan's Solution .... ℈ j
Peppermint Water, q. s. ....fl. ℥ iv
M. Sig.—A teaspoonful every three hours.

Much of the success in the treatment of the disease, depends upon the effectiveness of the topical applications. Local

inflammatory action must be subdued before the itching will cease, or a healthy condition of the affected part can be established. To accomplish this condition, saturate absorbent cotton or gauze pads with the alkaline solution and apply to the inflamed area; this course should be persevered in till the object sought has been obtained. The eczematous parts should now be frequently bathed with a solution composed of bichloride of mercury and tar water, as recommended in the treatment of pediculosis, which will be especially efficacious in chronic cases, presenting a thickened state of the integument.

The strength of this solution must be suited to the condition of the individual case, care being taken to avoid irritation in abraded states of the skin. Excellent results follow the use of the alkaline solution, as a topical remedy. It is especially commended in the treatment of eczematous states in children; it not only subdues the irritation, but relieves the itching as well. Another mixture for local application in acute cases to relieve the intense itching is the following:

℞.
Resorcin .... ℥ j
Phenic Acid .... ℥ ss
Glycerine .... ℥ j
Camphor Water, q. s. ....fl. ℥ vj
M. Sig.—Bathe the itching part every hour or two when needed.

Medicines incorporated with a greasy base are not popular with those afflicted with eczematous states. The following unguent is excellent, however, in thickened conditions of the skin about the joints, with a disposition to crack open; also in chronic states of tinea capitis, the surface of the scalp presenting a dry condition.

℞.
Salicylic Acid .... ℥ ss
Menthol .... gr. xx
Tar Ointment .... ℥ iij
M. Sig.—Rub well into affected areas three times a day. Last at bed time.

This mixture is excellent for eczematous affections of the palms of the hands and the soles of the feet. Distressing states of eczema about the genitalia in women, resulting from acrid leucorrhœal discharges, are benefited by vaginal injections of a

solution of borax water, three drachms to the pint, repeated three times a day, following with an application of the antiseptic solution. A dusting powder for most irritable conditions is often desired; the following agents well rubbed together will be found most efficient:

℞.
  Powdered Acetanilid .... ʒj
  Powdered Menthol .... gr. v
  Oxide of Zinc .... ʒiij
  Calamine .... ʒij
  M. Sig.—Dust on eczematous patches from a perforated covered box two or three times a day.

Bandaging is often required in eczematous states of the hands and feet to retain the medicinal agents in contact with the cracked and abraded parts, and to shield the same from coming in contact with unclean objects.

Very excellent results have followed the direct application of the violet ray in obstinate chronic cases of eczema, presenting a thickened indurated state of the skin, with periodical spells of intense itching.

Eczematous states of the legs, complicated by varicose veins, shoudl be bandaged during the day; and at night, garments of cotton or linen should be worn next to the skin; and in fact, all the time. Excoriated parts should be protected by pads of old linen or soft cotton, to prevent chafing.

Without special attention being given to the dietary of the eczematous patient, little benefit can be expected from medicinal means, as is often the case. The chief cause of the morbid state can be traced to over-indulgence in rich and undigestible food, necessitating an entire change of the bill-of-fare, reducing the quantity and often changing the quality of the same, and relying on a very simple, easily digested diet list.

The impoverished patient requires a stimulating, nutritious diet, while those who have been over-fed, will be put on stale bread and milk, graham bread and crackers, rice, custards, and fish instead of meats.

The coarser cereals are permitted and fruit juices should be freely indulged in. Fruits and vegetables are generally tolerated, but rich soups should be eschewed. Cocoa and pure water may be taken freely as a drink, while tea, coffee, wine and malt liquors usually aggravate the morbid state.

The enfeebled may indulge in broiled beef or mutton once a day, but sweets are usually harmful in all cases.

CANCER OF THE SKIN

All three varieties of malignant growths are found in the skin. Epithelioma is the most frequently observed, carcinoma ranks next in frequency, and while sarcoma is a rare affection of the integument, yet it does appear, generally as a secondary affection in connection with large moles and fibroma that takes on a degenerative condition, because of some wrong of nutrition or metastasis.

Most cases of skin cancer commence either in a warty excresence, moles, or chronic ulcer and are of rather slow growth. The area attacked with sarcoma is often colored with pigment, especially if the skin lesion is secondary, neither variety produces marked vascularity, as a general rule.

The characteristic symptoms attending malignant affections of the skin are creeping, stinging pain, some swelling and congestion of the part involved when well advanced, discoloration with pigment or purplish red, if the disease involves some of the seperficial blood-vessels, and infiltration of surrounding tissues in well advanced cases of sarcoma.

Treatment: The treatment of epithelioma demands prompt and active measures. Internal medication is seldom required, except in advanced cases where the vitality is low, appetite poor, and the process of blood making is markedly deficient. In such cases peptics, tonics and stimulants, together with good nourishing food is demanded. Locally, the diseased patch should be cauterized with chloride of zinc reduced to a liquid by adding glycerine, caution being taken not to apply the caustic agent too freely. A small wooden applicator may be used for the purpose, merely touching the small ulceration points in mild cases, the subsequent treatment consisting of an occasional application of the following mixture:

R.
Fowler's Solution .... ℨ j
Adrenalin Chloride Solution .... ℨ ss
Glycerine, q. s. .... fl. ℥ ss
M. Sig.—Apply to the ulcers as an after dressing.

Other escharotic agents are advocated, but they do not excel the potency of zinc chloride.

The X-ray, Finsen or radium light has been used with good results, where the morbid disease has broken down and exhibits an open sore, the rodent form of the affection. In the worst form of the disease, there may be valid reasons for excision of the growth, if it is situated where such an operation will be feasible.

The sarcomatous growth, if seen early, may be successfully attacked with the zinc mixture, or in the place of this, one or two applications of butter of antimony may check, for a time, further development of the disease. If the part heals and later shows a tendency to return, the caustic should again be used as at first.

Excision should be advised in advanced cases, if not contraindicted by the location of the morbid growth or the broken health of the patient. Coley's fluid is used with fair results in far advanced cases.

When a large wart or mole is located on the body where it is subjected to constant irritation, it had better be removed owing to the great liability of malignancy later attacking the incipient tumor.

The reader is referred to the articles on **epithelioma** and **sarcoma** for further advice along this line of treatment in a general way.

PALMAR ABSCESS

Abscess formation beneath the palmar fascia is occasionally met with and is the result of traumatism or infection from injuries of the fingers.

Heat, pain, redness, tenderness, spasm of muscles, and loss of function, are the most prominent symptoms from the commencement of the morbid state, until the abscess is opened and the healing process is well advanced.

The severe pain generally experienced in palmar abscess is due to confinement of the purulent matter by the dense structure surrounding it. The pus often gravitates backward through between the bones of the hand, pointing on its posterior surface

and again it may work its way upward, along the sheaths of
the muscles and point somewhere about the wrist, where fluc-
tuation is noted upon pressure. During the formation of the
purulency, the patient experiences rigors, which are followed
by hectic fever, headache, thirst and lassitude. If there is delay
in evacuating the purulent fluid, pyemic conditions often super-
vene and necrosis of the bones of the hand and wrist sometimes
occurs.

Treatment: The treatment consists in the early evacuation
of the pus by a rather free incision, the cleaning of the abscess
cavity with the alkaline solution, solution of bichloride 1-3000,
or Enzymol in full or graduated strength. Redressing should
be done two or three times during the twenty-four hours, for
the first few days, or until the wound commences to heal, then
less often. The arm should be suspended in a sling, or elevated
when exceedingly painful.

During the acute stage of the attack, aconite and echinacea
should be taken internally, alternated with such other remedies
as may be indicated. If the tongue is red and the breath bad,
a few drops of sulphurous acid may be taken in water every
three hours to advantage. Later along in the morbid condition,
supportive treatment will be indicated. In the absence of fever
tincture of iron, wine of pepsin, small doses of quinia, the lime
salts, strychnia, with a rich nourishing diet, will be required
in most cases, with an occasional dose of some quieting and
pain-relieving agent, at night to relieve distress and promote
sleep. Not infrequently, the patient recovers from the morbid
state with a crippled hand, caused by a stiffness of the wrist
joint and a contraction of the flexor tendons.

ALOPECIA

Loss of hair is due to several causes in each of which there
is more or less functional nerve disturbance. The morbid state
is observed in young children when it is due to some systemic
taint, eventuating in the arrest of the development of the hair
follicles; in persons of middle life, when it is caused by diseases
of the scalp, constitutional ailments, and compression of the

blood vessels of the scalp, and over-heating the same by wear-
ing poorly ventilated and tight-fitting hats; and in old age from
atrophic skin changes and other enfeeblements, incident to the
advanced stages of life. Another common cause of baldness is
the inattention given the scalp by way of bathing, and massag-
ing the same, permitting the accumulation of dandruff, which is
the principal cause of atrophy of the hair follicles.

Treatment: In prescribing a course of treatment for bald-
ness it will be well to withhold much encouragement in con-
genital cases, as well as in those occurring later in life, as cur-
ative efforts are of little avail where from the history of the
case, and from observation, it is evident that the hair follicles
have been destroyed. Where the loss of hair is the result of
acute diseases as typhoid fever, small-pox, and local affections,
there is a rapid return to its normal state on the restoration of
the general health. To hasten the new growth, it will be well
to give the scalp a thorough shampooing once or twice a week
with tar soap or the tincture of green soap, massaging the
scalp well, morning and evening, after which rub well into the
the scalp a liberal portion of the following mixture:

R.
    Fowler's Solution .... ℥ iij
    Tinct. Cantharides .... ℥ ij
    Glycerine .... ℥ ij
    Rose Water, q.. s. ....fl. ℥ iv
  M. Sig.—For external application to the scalp.

If for any reason the above mixture does not prove stimu-
lating enough, recourse may be had to the quinine solution,
which is highly commended:

R.
    Sulphate of Quinine .... gr. x
    Tinct. of Capsicum .... ℥ iss
    Spirits of Lavender .... ℥ j
    Glycerine .... ℥ ss
    Alcohol, q. s. ....fl. ℥ vj
  M. Sig.—Apply to the scalp once or twice a day, with brisk
    friction.

This mixture is efficient in Alopecia Areata, following
thorough massaging; in this form of baldness, much depends
upon the exciting cause; should it be the result of traumatism
with injury to the nerve supply to the affected part, no benefit

will follow any form of treatment yet advised; however, if the morbid state be the result of parasitic invasion, much benefit will follow the persistent use of a fifty per cent mixture of lactic acid and water applied once a day; this mixture should be used for two or three weeks, when the following solution should be substituted:

```
℞.
  Lactic Acid  ........................................ ℥ ij
  Quinine Sulph.  .................................... gr. x
  Tinct. of Capsicum  ............................... ℥ iiss
  Rose Water, q. s.  ............................. fl. ℥ viij
M.  Sig.—Apply to the bald spot morning and evening, with
  brisk friction.
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In all cases the general health should receive attention; the function of the skin and bowels should be stimulated to action, and the poorly nourished given peptics and tonics and the most nourishing of foods.

ABSCESS

Abscess formations are the result of local suppurative inflammation, and are divided into two classes, acute and chronic. While the process of development in each is not unlike, it seems to be a case of a distinction without a difference. It may be said that the ordinary form of the local disturbance is acute, and the chronic form results from some specific infection, arising from a systemic taint, likely to be syphilitic or tubercular. Early in the suppurative process a focus is set up, after which the adjacent tissue is rapidly converted into pus, which will point or gravitate in the direction of the least resistance.

Some parts of the system seem more likely to abscess formations than others. Regions supplied with lymphatic glands are frequently invaded. Especially is this so with the chronic form of the disease. The neck, arm-pit, and groin can be mentioned as locations frequently affected.

Pus from abscesses resulting from syphilitic, gonorrhœal and erysipelatous inflammation is highly infectious, as is that from opthalmia neonatorum; hence, care should be exercised in handling these cases, that the disease may not be transferred by contact.

Serious results frequently attend the formation of an abscess in the deeper structures, as the spleen, liver, lungs, and pelvic organs, pus frequently "pointing" at some distance from the primary seat of the disease. Especially is this the case in pharyngeal and psoas abscess. As each form of the morbid state here mentioned requires a special line of treatment, reference will be made to them later on, under separate heads.

The general symptoms denoting the formation of an abscess are heat, swelling, throbbing pain, local redness, and fluctuation. Œdema is often present where there is a complication of the vascular system. In the purulent form of the disease, hectic fever is a marked symptom, preceded by rigors, and followed by profuse sweating, and, in some cases, rapid emaciation.

Treatment. The object in the treatment of abscess is to evacuate the pus, establish drainage, and restore the affected area to its normal condition, aided by such applications as the case may demand. As cleansing agents, a weak solution of permanganate of potash, and the alkaline solution previously referred to, will be all sufficient. Should the cavity extend into the deeper structures, insert strips of sterilized gauze where practicable. When there is a troublesome oozing of blood, it may be well to pack the empty cavity with some one of the medicated gauzes.

Should the presence of pus be suspected near important blood vessels, remove any doubt by first inserting an asperating needle; if found, make an incision through the skin and superficial fascia; through this incision and the soft parts beneath thrust a pair of dressing forceps, closed, spreading the same as soon as the cavity is entered, giving exit to any fluid that may be found there. A rubber drainage tube may be found indispensable, through which irrigation may be accomplished.

Should there be symptoms of constitutional derangement, ' ich as hectic fever, rigors, nausea and vomiting, such remedial agents must be resorted to as will correct the systemic taint and support the powers of resistance.

Echafolta in peppermint water every two hours, alternated with an occasional dose of acetanilid, should the fever be high, will be indicated, and to give tone to the flagging powers qui-

nia, strychnia, and iron, will find a place, as will Fowler's solution of arsenic, taken in small doses.

Exhaustive diarrhœa, resulting from a crippled digestive function, can usually be controlled with pepsin, bismuth, or McMunn's elixir of opium, in two or three drop doses, taken in camphor water every three hours. In obstinate cases, teaspoonful doses of an infusion of the extract of logwood should not be forgotten. Repeated every two hours, it is a reliable remedy. It is made by infusing two drachms of the extract in a pint of boiling water.

A supporting diet is in demand in these cases. The extracts of meats, pigs feet jelly, gruels, custards, malted milk given on alternate days, with the juices of oranges and ripe berries and rich lemonade taken as a beverage.

Hepatic Abscess

Abscess of the liver is frequently met with in malarial districts; the disease often resulting from infection caused by drinking water laden with the germs of decayed vegetable matter, and breathing miasmatic atmosphere.

It frequently results from traumatism, and the habitual use of stimulants, as well as from typhoid fever and dysentery. Impaction of calculi is also a common cause of the disease.

In early stages of the morbid state prominent symptoms may be lacking; usually the first indication of the developing disease is a pronounced constriction and uneasiness, with a dragging weight in the region of the right scapula. In severe cases there is a jaundiced condition present, with rigors, and high fever. Nausea and vomiting are marked symptoms of the disease at this time; with night sweats, rapid, feeble pulse, and frequent discharges from the bowels. Should the abscess rapidly enlarge, respiration is interfered with, the patient has a troublesome dry cough, while percussion will detect a fluctuating mass if the abscess points to the surface. If the tissues overlying the liver become œdematous, it justifies a diagnosis of abscess of that organ

Treatment. The treatment of this morbid condition is entirely surgical. Remedial measures are of little benefit, other

than to support the vital forces, while operative procedures re-ieve the local disturbances.

Some relief may be obtained by the application of heat, in painful states, and an occasional dose of the hydrochlorate of heroin, administered hypodermically near the seat of the dis-ease, will give rest and temporary ease.

Stimulants and tonics will support the system, and whip up a lagging appetite. A nutritious diet should be supplied in generous quantities, and acid drinks are taken with a relish.

As soon as the presence of pus is suspected, it should be evacuated by aspiration, which may have to be repeated several times. The procedure is not without merit.

In cases where aspiration does not prove efficient, the ab-scess should be cut down upon and emptied. Briefly, the suc-cessive steps of the operative method are as follows: After the presence of pus has been determined by the use of the exploring needle, an incision is made through the soft structures overly-ing the liver, bringing this organ into view. ·If there are no adhesions, pack flat sterilized gauze sponges around the point selected for the opening, determining the exact location of the pus pocket by the hollow needle, and, using it as a guide, the knife is passed into the cavity, followed up closely with the fore-finger of the other hand, to prevent the escape of the purulent fluid, and aid in bringing the margins of the wòund in the liver forward while they are stitched to the edges of the abdominal wound. This accomplished, irrigate the abscess cavity thorough-ly with the alkaline solution, after which explore with the finger for other pus collections. If any exist, they should be emptied through the primary opening. After sponging out and cleans-ing the cavity, pack the same with sterilized gauze, which will act as a medium for drainage. Remove the gauze protective pads first inserted, and cleanse the adjacent peritoneum of blood stained fluids; see that the borders of the liver opening are in-tact with the edges of the abdominal wound, and if the surgi-cal toilet seems complete, dress the wound with antiseptic dress-ings, which should be changed once or twice a day while the discharges are profuse. The patient is placed in bed, and sub-sequently prescribed for as conditions arise. Use chromicized catgut for suturing the liver to the abdominal wound; for all

other work use silk-wormgut. Remove the packing in the abscess cavity every two or three days, and repack till the opening is well closed with reparative material.

Pulmonary Abscess

This morbid state is characterized by a collection of purulent fluid in the tissue of the lung. Persons suffering from the ravages of pneumonia, and subject to the breathing of noxious vapors, and the feebly inclined, are prone to the disease. It may also result from secondary or infective inflammation, caused by plugging up of a blood vessel, or lymph channel, by an infected embolus, as well as from traumatic injuries.

The diagnostic features of the affection are often masked. Should it follow pneumonia, the character of the fever, and expectoration, will determine the nature of the disease. The former will be hectic in character, and the latter will likely contain pyogenic germs.

Ausculation may determine abnormal sounds, but nothing definite as to the abscess formations. Rigors, hectic fever, purulent expectoration of foul-smelling pus, which contains streptococci and staphylococci, are better evidence of the disease.

Treatment. The medical treatment should be stimulating and supporting. Special attention must be given to the functions of digestion and assimilation of food, which must be nutritious and of strength-giving qualities. The diet mentioned in the treatment of psoas abscess will be suitable here, and in connection the patient should seek a suitable climate where he can live principally an out-door life, as exercise and fresh air are indispensable to recovery.

As a peptic and stimulant, useful in hectic conditions, give the following:

R.
 Fowler's Solution .... $\mathfrak{Z}$ j
 Elixir of Glycero-phosphate of Lime and Soda, q. s. fl. $\mathfrak{Z}$ iv
 M. Sig.—A dessert spoonful every three hours, taken in a half
 wine glassful of cold water.

This can be alternated with the following mixture, which is invaluable in stages of extreme weakness:

℞.
> Fellow's Comp. Syrup of Hypophosphites .... ℥ i
> Colden's Liquid Beef Tonic .... fl. ℥ iii
>
> M. Sig.—A dessert spoonful in a little cold water before or after meals.

For the cough, and to modify the nauseating odor and taste resulting from the fetid sputum, use the following mixture, in small doses:

℞.
> Carbonate of Guaiacol .... ℨ iiss
> Oil of Sassafras .... ℨ ss
> Heroin .... grs. v
> Syrup Simplex, q. s. .... fl. ℥ iv
>
> M. Sig.—A half teaspoonful, gradually increased to one teaspoonful, every two or three hours, as may be needed to control cough.

Nausea is usually controlled by a few drops of the essence of peppermint on the tongue, or a clove held in the mouth.

If, after the diagnosis of the abscess has been made, operative procedures are determined on, the successive steps should be about as follows: The skin surface is first rendered sterile by the use of soap and water, followed by alcohol, and lastly by a solution of bichloride of mercury—1 to 1000. Make an incision over the previously located abscess cavity about two inches in length, through the skin and subjacent tissue; through this incision introduce a small asperating needle, which has been previously sterilized, for making an exploration. The needle should be carefully passed between the ribs, and on into the lung tissue. If the cavity is entered, attach the syringe and make suction; pus will appear in the syringe if the needle has entered the abscess.

The needle should be at least four inches long, and it may have to be passed in different directions before the cavity is located. The pus may be so thick that the exploring needle will fail to disclose it. Should the conditions and symptoms still point to its existence, carefully introduce the long, slender blades of a uterine dressing forceps, closed, which is to be opened after it has entered the cavity. If this method locates the abscess, cut down upon and remove a portion of the rib overlying the cavity, with bone forceps. Usually a portion of two ribs, about three inches long, is sufficient. Reinsert the exploring instrument, using it as a guide for the knife, or long scissors now

used to open the abscess, care being taken not to make a larger
opening than will admit the fore finger, which is to be used as
an exploring medium to free the cavity of all foreign matter.

Irrigation being contra-indicated, the abscess cavity is
cleansed by carefully swabbing with sterilized gauze, on sponge
holders; after which insert a rubber drainage tube, or strip of
sterilized gauze, for drainage, the same extending out of the
chest wound.

Usually the pleural covering of the lung is adherent to the
chest wall, preventing a collapse of the organ after opening the
pleural cavity. When no adhesions exist, gauze pads are in-
serted around the point selected to make the incision, to pro-
tect this cavity from the discharging fluids.

The wound in the chest is dressed with antiseptic dressings,
which will need removing once or twice for the first twenty-four
hours; later once a day may be sufficient. The cavity, if all goes
well, usually closes rapidly, and within a few days the drainage
mediums can be dispensed with.

Hemorrhages following operative methods require absolute
rest, a spare diet, and absence of excitement.

Psoas Abscess

A collection of purulent fluid in the cellular tissue in the
lumbar region, posterior to the peritoneum, is called psoas ab-
scess. The affection is usually the result of necrosis of one or
more of the lumbar vertebræ, although the disease often arises
from injuries received in the lumbar region. Persons that are
feebly inclined, and especially those of a tubercular diathesis,
are prone to the morbid state.

There are no marked symptoms accompanying the early stages
of the disease. However the patient may complain of a general
weakness, some lameness or soreness across the loins, an after-
noon temperature with a variable appetite. Often the first
evidence of any wrong is the discovery of a tumefaction in the
region of Poupart's ligament, the femoral fascia, or in the region
of the knee. This is occasioned by the gravitation of pus along
the sheath of the psoas muscle and that of the muscles of the
thigh. Cases are on record where the fluid has found its way
into the pelvis and finally pointed in the tissues near the anus,

and in cases where the pus forms high on the vertebral column it sometimes finds its way directly backwards from the diseased area. There is little or no pain accompanying the progress of the disease, at least not as much as might be expected from so serious an affection of deep pelvic tissue.

Treatment. Should the nature of the disease be detected in time, at least when it first points above Poupart's ligament, the tumefaction should be opened at once, to prevent the extension of the disease to other parts. This should be done of course under proper antiseptic precautions. The operative procedure of Treves, in opening the abscess cavity directly from behind, when the early diagnosis is reasonably sure, is feasible and in a great measure devoid of danger. An incision is made through the skin and superficial fascia along the outer border of the erector spinæ muscle extending from an inch or two above the last rib to a point just below the crest of the ilium; these structures are separated and the underlying fascia divided, and muscles separated and drawn to one side with retractors, aided by the fingers, until the cavity of the abscess is reached, and the contents evacuated, after which irrigate with bichloride of mercury solution (1 to 5000) thoroughly, that every part of the abscess wall is carefully cleansed of pus and carious matter, aided by the use of a swab of sterilized gauze on a sponge holder. After repeated washings that assurance can be had that all diseased matter is cleansed away, the cavity is wiped dry and closed in the usual way, first the muscles and fasciæ, lastly the integument, using silk-wormgut for the deeper structures, and for the skin and superficial fascia catgut, with or without drainage as the nature of the case will suggest. Some surgeons fill the cavity with iodoform emulsion before closing the wound, leaving it for a week or ten days undisturbed. The results have been successful in the large majority of cases.

The after treatment is that of rest in bed for a reasonable length of time, with attention to the general health that each case will demand. If the abscess wound does not do well after it has been cleansed with iodoform emulsion, and the parts involved again begin to break down, the process of washing out the cavity with bichloride solution can be again resorted to, followed by antiseptic dressings.

As an internal remedy to support the resisting powers of the system, the following mixture is commended;

R.
   Fowler's Solution .... ℥ i
   Syrup of Lacto-phosphate of Lime .... ℥ iv
   M. Sig.—A teaspoonful every three hours, taken in a little water.

Iron and strichnia, manganese, and some of the bitter tonics often indicated, with a diet that is nutritious and appetizing, juicy steaks, meat jellies, pickled pigsfeet, oysters, graham and rye bread, with buttermilk, claret wine, lemonade and sometimes a little coffee, taken as a drink, will prove beneficial.

SCABIES

Scabies is decidedly a parasitic disease, and is prone to attack persons that are uncleanly in their habits. It is commonly met with among the lower classes, and it being an infectious disease it is transmitted by contact and through the medium of infected clothing.

The disease usually manifests itself first between the fingers and on the front of the wrists, and is characterized by a vesicular eruption which, in severe cases, by continued scratching, the vesicles are ruptured, forming crusts; the skin becomes thickened, excoriated and tender to the touch.

Treatment: Cleanliness is the first step in the line of treatment. A general bath in biborate of soda water, should be taken every other day at the outset, and as a topical application to infected areas, few, if any, remedial agents are more active in the destruction of the parasites than a twenty per cent solution of sulphuret of lime, applied morning and evening. Precipitated sulphur is a valued remedy for the cure of this disease, as is balsam of Peru; but their form of application being in a mixture with some greasy base, these agents are eschewed by the afflicted.

A ten per cent solution of beta-naphthol in water, applied to infected parts two or three times a day, is an efficient mixture, cleanly, and free from odor. Should the parts become excoriated and tender from continuous scratching and a medicated

lubricant is needed, make use of a mixture of styrax in lard, one ounce of the former to three of the latter, applied twice a day, last on retiring.

PERNIO—CHILBLAIN

Pernio is a painful itching state of parts of the feet, occasioned by their being subjected to intense cold. The skin and fascia are the parts mostly affected, although if severely frost-bitten, the deeper structures become involved. The toes and the sides of the feet are the most likely to be affected, the most severe cases having a tendency to terminate in gangrene. The parts affected are usually red, swollen, and very tender to the touch, and any attempt to relieve the itching by rubbing or scratching, intensifies the morbid condition. The feeble and anemic are more apt to suffer from chilblains than are the robust.

Treatment: The treatment for pernio in the acute stage, should embrace such topical applications as will subdue the hyperesthesia and relieve tenderness and itching. A solution composed of equal parts of tincture of veratrum and witch-hazel, painted over the affected area every hour or two, accomplishes a good purpose, as does aconite, belladonna, and tincture of opium. A potent mixture to subdue the irritable condition experienced in most cases is prepared as follows:

℞.
    Cider Vinegar ....
    Glycerine, āā .... ℥ j
    Bismuth Sub. Nit., q. s. to form a thin paste.
    M. Sig.—Paint over inflamed and tender surfaces every two or three hours.

An excellent mixture to relieve the intense itching after the acute inflammation has been subdued, is composed of the following ingredients:

℞.
    Potassium Carb. .... ℥ ss
    Tr. Opium .... ℥ iij
    Aqua Dest., q. s. ....fl ℥ xij
    M. Sig.—Use topically to itching parts every hour or two.

If the tissues are so badly frost-bitten that certain areas

become necrotic, the sloughing away of the dead tissue should be favored by the application of antiseptic solutions and the wounds dressed with antiseptic powder or washes till healed. Extreme cases of frost-bite, with death to the tissues, will necessitate amputation as soon as the line of demarcation becomes manifest.   In such cases, the patient should be well nourished with stimulating foods and the appetite whipped up with peptics and tonics.

PEDICULOSIS

This is truly a parasitic disease common among persons of uncleanly habits, and is characterized by itching, scratch marks, and later hemorrhagic crusts or scabs.

There are three forms of the parasite that infest the human system; the head louse that is common among persons who rarely wash and dress the hair; the body louse that is found especially along the seams of the garments, and at times on the surface of the body. They creep about during the hours the person is at rest, setting up an intense itching by their crawling and biting. And the pediculosis pubis or crab louse that infests regions covered with hair, especially about the pudendal and perineal parts. This parasite is common among the unchaste, and those persons who seldom bathe, or have a change of raiment.

All three forms of the disease are infectious and are transferred by contact with the infected person or his clothing.

Treatment: The first step along the line of treatment of any form of the disease is to thoroughly cleanse the infected parts with tar soap and water, which should be repeated daily for a week or two. The next step to rid the scalp of the malis pediculi, or head louse, is to make free use of a fine tooth comb once or twice daily, after which the hair should be well dressed with bay rum or dilute acetic acid, two ounces to the pint of distilled water. This method of procedure is usually efficient and will vanquish the pests within a week or ten days.

Besides bathing the body for the riddance of the body lice, all clothing coming in contact with the body, either wearing apparel or bed clothing must be thoroughly sterilized by steam

or boiling water. This method if faithfully carried out will be all sufficient within a few days, but should a germicide be demanded, none better can be applied than the following solution which not only kills the lice but relieves the tantalizing itching as well.

℞.
　Corrosive sublimate .... gr. x.
　Alcohol .... ℥ j
　Tar Water q. s... fl O j
M.　Sig.—Apply to affected parts morning and evening with a small sponge.

Sulphuret of lime (℥ ij to water O. j.) applied two or three times a day is also an active germicide, and is commended in this form of the disease.

For the riddance of the crab louse, the infected parts should be washed with tar soap and water, morning and evening, after which apply with a small sponge, a solution composed of the following agents:

℞.
　Bichloride of mercury .... gr. vi.
　Alcohol .... ℥ ss
　Witch hazel .... ℥ j
　Tar　Water, q. s. ......　.....................fl. ℥ vj
M.　Sig.—Sop on infected　parts twice a day.

If after a few days, the nits and lice still exist, dust on the infected hair calomel, using a pledget of cotton batting, twisted on a probe or stick as a convenient medium with which to apply it; care being taken to have the skin well dried before applying the powder, as it will cause active irritation within a few hours without this precaution. Should this take place, bathe the parts with borax water, dry carefully and apply a little cold cream.

PRURITIS

This is a symptomatic disease of the skin, local or general in character, attended by an itching irritation, which is a marked diagnostic symptom, with or without any noticeable alteration in the structure.

If the disease is of long standing, the integument may become thickened and excoriated from continued scratching. A

marked feature of the disease is its aggravation at night, seemingly from the warmth of the bed-clothes.

Pruritis arises from numerous causes, chief among which are digestive and intestinal disorders. It is a prominent symptom of diabetes and Bright's disease, and accompanies morbid states of the genito-urinary organs. Hemorrhoids and fissure provoke pruritis ani, as does intestinal parasites. Irritable states of the nervous system often give rise to an intolerable itching difficult to control.

Treatment to be effectual must depend upon the removal of the existing cause. If the itching results from an irritable condition of the fluids of the system, give broken doses of sulphur of magnesia till bowels move freely, after which the following mixture will be found efficient:

 ℞.
  Spec. tr. aconite .... gtts x.
  Spec. tr. apis mel. .... gtts xx
  Spec. tr. jaborandi .... gtts x
  Peppermint water .... fl ℥ iv

 M. Sig.—A teaspoonful every half hour; every hour in aggravated cases.

Where there are marked burning sensations accompanying the itching, the following prescription may be substituted for the above, or given in alternation with it:

 ℞.
  Spec. tr. Aconite .... gtts x
  Spec. tr. rhus tox .... gtts xv
  Spec. tr. hydrastis .... gtts xx
  Aqua dest .... fl ℥ iv

 M. Sig.—A teaspoonful every two hours, and in connection give two drops of Fowler's solution after each meal in a little water.

Pruritis resulting from constitutional disturbances, as Bright's disease or diabetes, and hepatic ailments, is relieved by appropriate treatment of these exciting causes. Pruritis ani, when resulting from hemorrhoids or intestinal parasites is to be treated by internal doses of sulphur, twenty grains in a little sugar morning and evening, while those cases arising from nervous disorders will do well on the following mixture:

℞.
    Sodium Bromide .... ℥ ii
    Chloral hydrate .... ℥ iss
    Camphor water ..._..............................fl ℥ iv
M. Sig.—A teaspoon every three hours, with a double dose
    at bedtime to insure rest and sleep.

Borax water baths should be taken once a day, after which
the itching parts are to be bathed with the following solution:

℞.   .
    Carbonate of potash .... ℥ ss
    Tr. of opium .... ℥ i
    Aqua dest. q. s. ....fl O i
M. Sig.—Apply to itching parts every two or three hours.

Another efficient lotion is composed of the following agents:

℞.
    Bichloride of mercury .... grs. v
    Witch Hazel .... ℥ ii
    Tar water ....fl ℥ iv
M. Sig.—Apply with a soft cloth every three hours.

This lotion is efficient in pruritis of the anal and pudendal
regions.

Salves and pomades are not commended in pruritis, except
it be in excoriated cases, when the following mixture will prove
efficient:

℞.
    Phenic acid .... gtts xx
    Juniper .pomade (Howe's) .... ℥ ij
M. Sig.—Smear on excoriated and itching parts three times
    a day, last at bedtime.

The function of the kidneys and bowels must be kept normal
with saline diuretics and laxatives, and the diet should not be
composed of stimulating dishes. Rice, custards, meat jellies,
and the coarser cereals are commended, with plenty of pure
water and weak tea as a drink.

LUPUS

Lupus is commonly known as a tubercular disease of the
skin and subcutaneous tissues. There are two varieties described
by dermatologists, viz: lupus erythematosus and lupus vulgaris;
the former is characterized by flattened growths of the integu-
ment appearing as reddened patches and usually covered over

with grayish yellow scales, while the latter form is distinguished
by reddish brown patches, usually covered with hard nodules and
small papules, which sooner or later terminate in ulcers, which
in healing, leave indurated scars.

Both forms of the disease commence with small points of
discoloration or papules upon the skin surface, which spread and
finally coalesce, forming large splotches in the erythematosus
form of the disease and tubercular patches in the vulgaris
variety. A characteristic feature of the erythematosus variety
is the forming on the surface of the affected area, of yellowish
scales, that seem markedly adherent to the thickened skin be-
neath. The morbid condition is generally accompanied with a
burning and itching, that the tenderness of the skin makes most
unbearable. The progress of the disease in either variety is
slow, lasting months and even years in some cases; leaving scar
tissue in most instances to mark the previously ulcerated area.

It has been observed that lupus erythematosus attacks in-
dividuals of middle age and later in life, while the other variety
frequently attacks children under ten years of age, especially
those of a tubercular diathesis.

Lupus erythematosus is prone to attack the skin about the
face and may extend to the mucous membrane of the mouth,
while lupus vulgaris not only appears on the face and neck, but
it often attacks the deeper structures, as the cartilages of the
ears, nose and larynx. So frequently does this variety of the
disease resemble mild types of malignant affections that the
patient becomes weak and reduced in flesh through constant
worry over what the outcome of the affection will be. Not in-
frequently a peculiar feature of this disease is noted, of one part
of a lupus ulcer healing while at another part the morbid pro-
cess will be destroying tissue and spreading.

The cause of the destructive disease is in most cases ob-
scure; it is observed, however, that individuals suffering from
scrofula, eczema and other systemic taints are prone to the cu-
taneous disease.

Treatment: The treatment of lupus should be, in the main,
by local measures. If the affected area is inflamed and tender,
soothing antiphlogistic applications should be first applied; if the
lupoid eruption is situated where the application of a poultice
can be supplied, one consisting of slippery elm, flaxseed, or packs

of absorbent cotton, wet in a solution of witch-hazel and water, equal parts, should be employed for twenty-four hours; following the poultice, the affected area should be painted over with a mixture of the following ingredients:

R.

Biborate of Soda .... ℥j
Salicylic Acid .... ℥ss
Glycerine .... ℥ij
Rose Water, q. s. ....fl. ℥iv

M. Sig.—Apply to the eruption or ulceration every two hours.

In ulcerated states of the skin, with indurated margins, the
- ingredients of the above prescription will prove efficient, but should vary in strength as follows:

R.

Biborate of Soda .... ℥ij
Salicylic Acid .... ℥j
Glycerine .... ℥ss

M. Sig.—Apply to the ulcers once or twice a day, last at bed
time, using the alkaline wash every two hours between times.

In three to five days the caustic solution may be dispensed with, in ordinary cases. If the ulceration proves obstinate and a more active escharotic is needed, the following mixture may meet all requirements:

R.

Chloride of Zinc .... ℥j
Cold Cream .... ℥iij

M. Sig.—One to three applications will stop the necrotic pro-
cess and put the ulcer in condition to heal.

Outside of a resorcin ointment or a calamine mixture, little benefit is derived from greasy applications in the treatment of lupus, except in a dry and indurated state of the skin. Antiseptic lotions usually bring about a cure much quicker than do oily mixtures. Where the tissues are puffy and exude a considerable amount of serum the diseased parts heal under the soothing qualities of oxide of zinc or myrrh, two drachms,and calamine two ounces.

Aggravated cases of lupus vulgaris will necessitate curetting away the morbid tissue or its removal by incision, especially when the deeper structures are involved.

The healing process may be hastened by giving such internal remedies as will stimulate an appetite, enrich the blood and regulate the body functions. If the features are pale, showing sys-

temic weakness, arsenic, tinct. of phosphorus, sulphur and the lime salts are indicated and should be given as may be indicated in the individual case. Two or more of the above named remedies may be given one week and alternated with the others the succeeding week.

The diet should consist of rich and easily digested food, taken in proper quantities and at regular intervals. Salt baths should be frequently taken.

LEPROSY—LEPRA

Leprosy is a transmissible disease, simulating tubercular affections in a marked degree. It is appropriate to mention the morbid condition in treatises on surgery, as the systemic infection often results in conditions which come to the surgeon for operation. The bacillus of leprosy, while not unlike that of tuberculosis in appearance, is distinguished from that organism, chiefly by the method of staining by the Gram method and the alcoholic solutions of aniline, which process does not so fully develop the tubercle bacillus.

The early phases of leprosy are characterized by numbness, fever, debility, digestive disturbances, hemorrhagic states, leprous splotches appearing on the face, neck and limbs, and fibrous lumps or nodes later manifesting themselves on various parts of the body, chiefly on the limbs, neck and the external genital organs; later along in the course of the disease, ulceration usually sets in and the patient becomes physically prostrated. Such is the course of the tuberculous form of the disease; the non-tuberculous, or anesthetic form being distinguished by such features as pronounced hyperesthesia of the skin, followed by large eruptive spots, appearing on the body and extremities, which spread or extend something after the form of a ring-worm, leaving that portion of the skin's surface, over which the disease has spread, in an anesthetic state. Like the tuberculous form, the eruptive spots are likely to break down by ulceration, which often becomes of a grave character, producing death by exhaustion.

Isolated cases of this disease have been observed in all

countries of the world, it being more prevalent, perhaps, in the far eastern countries, and many of the south-sea islands. It is claimed that heredity plays a prominent part in the development of the morbid state, but uncleanly habits and climatic conditions are largely responsible for the disease.

As the manifestations of the disease are all of a chronic nature, the patient may live for many years, but considering the disease from the basis of a cure the prognosis must be pronounced unfavorable.

Treatment. To be effective the treatment must be both local and general. Strict attention should be given the hygienic surroundings, and the dietary should be composed of the most nourishing and strengthening of foods.

The patient having this disease should be isolated, and a general bath taken once a day in biborate of soda water. To whip up a lagging and capricious appetite arsenic, strychnia, and albuminized or the acid solution of iron in tangible doses should be taken after meals, either singly or in combination. The following mixture is commended in enfeebled states of the system :

℞.
    Fowler's Solution of Arsenic .... ℥ j
    Glycero-phosphate Comp. (Sharp & Dohem's) .... ℥ vj
    M. Sig.—A table-spoonful every three hours, or after each
    meal, as the case may determine.

The oil of chaulmugra prepared from the seeds of an East Indian tree is a highly valued remedy in that country for this disease, administered in five to ten drop doses in capsules. The oil is also applied locally to the ulcerated states of the disease, but it cannot be said to be superior to the balsam of Peru to stimulate a healthy state of the ulcer. Another valued antiseptic mixture for local treatment of ulcerated sores is composed of salicylic acid, biborate of soda, and glycerine ; a drachm of the former, two drachms of the soda, to two ounces of the glycerine, well incorporated and applied three or four times a day. Physicians who have had an extensive experience with the X-ray in the treatment of the local manifestations of this disease speak in high terms of its efficiency. Strychnia in full doses should be given in the anesthetic form of the disease.

BED-SORE—DECUBITUS

Bed-sores are inflammatory ulcerations of greater or less intensity, appearing on the prominent bony parts of the body, and are observed in persons who have been confined to their bed for long periods of time, and especially those who are weak, feeble, and poorly nourished. Pressure upon recumbent parts is the principal cause of the morbid state; these ulcerations are frequently observed in typhoid states, and in the latter stages of consumption, as well as in cases of severe injuries.

The treatment should be both prophylactic and curative. Where the patient has been confined to his bed for a long time, prominent portions of the buttocks, back, and perhaps the heel will become inflamed and very tender; these points should be relieved of the pressure, and the inflamed area bathed with alcohol, or spirits of camphor three or four times a day. At least twice a day the part should be washed with a weak solution of borax water, after which dust the surface well with oxide of zinc, after first drying well. Later an absorbent pad should be adjusted to the part, held in place with strips of adhesive plaster; or the affected part may be made to rest on an air cushion or water-bed. If the sore results from excessive perspiration, or it becomes infected with urine, means must be adopted to correct the uncleanly condition before much good can be expected from the application of medicinal mixtures. If the morbid state becomes the seat of phagedenic ulceration, strong antiseptic washes should be frequently used, the best of which is the alkaline antiseptic solution. Excellent results have also been obtained from the use of campho-phenique in these grave cases, where every other antiseptic mixture failed to hold the necrotic process in check. Every effort must be made to improve the general health by the judicious use of tonics, and peptics, and rightly prepared nutritious food. The hygiene should be of the best.

DACTYLITIS

Dactylitis is a disease of an inflammatory character, affecting the bones of the fingers and toes. It is very apt to appear

as one of the results of severe systemic affections, hence it is often observed in individuals suffering from late phases of syphilis and tuberculosis.

The disease is destructive in character, the soft and bony structures of the feet and hands often undergoing degeneration to the extent that necrosis sooner or later necessitates amputation. Not every case of this disease is of so grave a character, cures often being accomplished through appropriate treatment, especially in individuals possessing marked resisting power against the ravages of the disease.

The symptoms accompanying this affection are tenderness and pain, swelling, and, to a certain degree, deformity in advanced cases.

Treatment: The treatment of the syphilitic variety of the disease should consist of such internal remedies as will neutralize the venereal taint that is devitalizing certain parts of the system and placing the patient upon a course of dietetics that will maintain the bodily strength of the individual.

Donovan's solution of arsenic in two or three drop doses after meals, diluted with a little water, will prove efficient in individuals of a weakly constitution, while the more robust will do well on protiodide of mercury in one-tenth grain doses three or four times a day.

Iodide of potassium, two drachms, dissolved and added to eight fluid ounces of syrup of Trifolium Compound and given in two drachm doses, will benefit most cases from the start. Digestive disturbances should be corrected and the excretory organs whipped up to functional activity.

If abscesses occur as a result of necrosis of the osseous structure, they should be opened, the necrotic tissue removed with the sharp curette and the wound subsequently treated with antiseptics.

Ulcers not infrequently appear at the root of the nails in connection with the bone lesion; these should be touched every second or third day with a wooden applicator, dipped in pure carbolic acid or a dilute mixture of chloride of zinc with a subsequent dressing of the alkaline mixture.

The treatment of the tubercular form of the affection will require the adoption of such measures as will improve the general

health with the local treatment advised in the syphilitic form of the disease. To accomplish the first, the patient should be advised to choose a diet nutritious and strengthening and live an outdoor life as far as possible. Remedial agents that will improve the appetite and give a better condition of the blood should be made use of. Phosphorus, arsenic, iron, vegetable oils, and the lime salts should be thought of in this connection.

Amputation will be required in cases where the bones are extensively diseased and where the soft tissues are involved in the necrotic process.

FROST-BITE

Inflammation affecting the skin and the subjacent tissue, caused by the exposure to severe cold, is called frost-bite. The nose, ears, feet and hands are most commonly affected; however the devitalizing effect may become general.

The feebly inclined, and persons suffering from great exhaustion are prone to suffer. The part affected becomes somewhat puffy at first, slightly inflamed, and has a peculiar tingling sensation; this is succeeded by a purplish color, with lessened sensibility. In severe cases the blood becomes congealed, the part turns to a grayish white, is hard, and all sense of feeling is destroyed; the circulation being shut off, the part shrinks up and dry gangrene soon results.

Treatment. Treatment consists in applying cloths wrung out of ice water, with brisk friction; in acute cases, followed by the application of spirits of camphor, turpentine liniment, or painting the surface quickly with pure carbolic acid, followed immediately with a pledget of gauze or cotton batting soaked in alcohol, and the part should then be wrapped in warm cloths. Where the chilling has been severe enough to produce a general systemic effect, a comatose condition supervening, small and frequent doses of stimulants are indicated, and should be given in the form of hot whiskey sling, brandy, hot tea or coffee; the local applications mentioned stimulate the benumbed parts and also relieve the intolerable itching that frequently accompanies the inflammatory process.

If the injury has caused death to small areas, under anti-

septic treatment the damaged tissue may separate and come away; or if the deeper structures are implicated, such as the cartilage, tendons, and bone, these should be cut away, and the wound dressed antiseptically as each case will demand. It is advisable to defer operative procedures until the line of demarcation presents, when the amputation should be done a safe distance above it. The functions of the body should receive attention, and the vitality of the system be kept at a normal standard by the administration of peptics and tonics, and the food should consist of the most acceptable nutrients, and appetizing dainties.

LEONTIASIS

Leontiasis is an affection of the bones of the face, especially the frontal and that part of the superior maxilllary bone that forms a part of the orbit. The disease is recognized by pathologists as possessing some phases in common with leprosy and when well developed, the features about the forehead and eyes become abnormally enlarged, giving the individual a peculiar appearance, akin to a lion's face, hence the name leontiasis.

The principal diagnostic feature of the affection, is the morbid change that takes place in the bones that are involved in the morbid condition.

The enlargement of the bones is slow and is unattended by pain, except when some important nerve trunk is encroached upon or large vessels are occluded.

No form of medicinal treatment that has yet been tried has had the effect to stay the morbid process for any length of time. The iodides are indicated by the progressive growth of osseous tissue and as the cause of the disorder is likely to be some tubercular taint in the blood, the iodide of arsenic should also find a place in the treatment. If the outgrowth of bone encroaches upon important nerves, vessels, or organs, the prominent portions should be cut away.

PART EIGHT

Lesions of the Thorax and the Enclosed Organs

OPERATIONS ON THE HEART AND PERICARDIUM

The pericardium is tapped or incised when that membranous sac is distended with water (hydropericardium,) blood (hemopericardium,) or pus (pyopericardium). The trocar or aspirating needle should be of small caliber and thoroughly sterilized before it is introduced.

Before attempting the operation the anatomical points surrounding the heart should be thoroughly understood, that unnecessary injury may not be done to adjacent vital organs or the heart itself.

About two inches of the anterior superior portion of the pericardium lies behind the sternum and at the base of this membranous sac in front is located what is known as the pericardial cul-de-sac which presses well forward and rests, when distended, in or near the interpleural space located at the junction of the middle and lower third of the sternum and bearing to the left of that bone about on a line with the intercostal space between the sixth and seventh ribs, the diaphragm forming the floor below.

The size of the interpleural space may vary and its location change through pleural adhesions or effusions if of a marked degree; and as the diaphragm forms the dividing membrane between the interpleural space and the abdominal cavity any distension of the latter is apt to displace the space upward much beyond its normal location, making it possible for the aspirating needle or trocar to be plunged into the abdominal cavity when entered through the fifth or sixth intercostal space.

There is some danger of wounding the internal mammary artery when introducing the needle. The vessel rests upon the

triangularis sterni-muscles and behind the cartilages of the ribs about one half inch from the border of the sternum; should this accident occur the vessel must be cut down upon, picked up and clamped or ligated.

The tapping may be done under local anæsthesia if the patient is not too nervous or excitable, otherwise a mild general anæsthesia may be induced. The surface, of the chest is prepared in the usual way and the point of entrance between the fifth and sixth rib marked with a cross. A small puncture is first made in the skin and external fascia with the point of a sharp bistoury through which the trocar or aspirating needle is introduced. If the intercostal space is found too narrow to admit of the entrance of the trocar, the sixth space should be chosen and the needle entered within about one-third of an inch from the edge of the sternum and directed inward to avoid wounding the pleura to the depth of a half inch or more, the handle of the trocar or outer end of the needle is slightly raised and the point plunged forward into the pericardial sac.

Following the evacuation of the fluid the punctured wound in the skin should be closed with a piece of zinc oxide plaster.

If the collection of water within the sac is the result of some serious organic lesion nothing more than temporary relief need be expected from aspiration, as the fluid ·soon accumulates again.

Opening up the pericardium by incision (pericardiotomy) is sometimes resorted to for the evacuation of purulent fluids, and for exploration and suture of wounds in the pericardium and walls of the heart.

The patient should be prepared for the operative work in the usual way and anæsthetized. If the drainage of the pericardial sac is the object sought an incision some three inches in length is made over the cartilage of the fifth rib extending from the margin of the sternum to a point a little external to the junction of the costal cartilage and the osseous structure. The soft parts are dissected free from the cartilage with a knife or periosteal elevator and the latter removed with bone-forceps. The tissue lying immediately beneath the cartilage is divided exposing the internal mammary arteries which should be doubly ligated and severed with scissors. The triangularis sterni mus-

cles upon which the arteries rest and which also form the parietal layer of the pleura should be incised, or separated with the handle of the scalpel and held to one side with blunt retractors exposing the pleura which should next be separated from the edge of the sternum with an elevator, being careful not to enter its cavity while detaching it. When liberated it should be retracted outward with a blunt retractor when the pericardium will be brought into view. The membranous sac should be picked up with toothed forceps and divided, at the same time pulling the edges of the sac outward and when the cavity is freed of abnormal fluids they should be united to the margins of the skin with catgut by a continuous suture. If the nature of the case requires provision for drainage a few strips of sterile gauze may be twisted and placed in the lower part of the wound. The extremities of the external wound should then be closed with catgut up to the union of the sac with the skin and dressed antiseptically.

To reach the heart when required to suture incised wounds, a much larger opening will, of necessity have to be made in the chest wall than for simple drainage as in the case above described. An oval incision commencing at the edge of the sternum a little above its junction with the fourth rib, extending outward a little behind the termination of the costal cartilages and ending a little below the lower border of the seventh cartilage is made, dividing the solf structures to the ribs, and the flap dissected back to the border of the sternum exposing the costal cartilages, of which one or more is resected commencing with the fifth and including the fourth and sixth if the nature of the case require these structures removed to give ample room to execute the work. The intercostal muscles are next severed from the edge of the sternum and the muscular flap turned back over the end of the ribs, exposing the internal mammary vessels beneath, which are usually picked up and ligated above and below and divided, or they may be pulled to one side with the triangularis sterni muscles with a blunt retractor, together with the adjacent plural projection after the muscular structures are freed from the sternum. The pericardium is now exposed and should be picked up with forceps and divided between them from below upward, and, if possible on a line with

the wound made in the pericardium, being careful not to wound the heart. By retracting the edges of the pericardium it will be made possible to bring the wound in the wall of the heart into view when the required number of silk sutures should be placed, using a moderately curved round needle that should be made to enter and emerge about one-eighth of an inch on either side of the wound and taking a good deep bite of tissue; but at the same time being careful not to penetrate the cavity of the heart. If possible introduce the needle, and place the suture and tie it during dilation (diastole) of the heart. After placing the first suture use the long ends for traction, this often aids materially in placing the remaining sutures by bringing the wound well into view and steadying the heart while introducing the needle.

The operative work should be executed as rapidly as possible and the patient's strength sustained by strychnia, brandy or digitalis given hypodermically. If the nature of the injury will permit, the wound in the percardium should in the main be closed, except perhaps a small space at the lower extremity of the incision where provision may be made for drainage; where this is done a small part of the incision in the skin and fascia should be left open for the drainage gauze to emerge.

Following the operation the patient should be kept at rest in a half reclining position for several days and in the meantime given fluid foods that are most nourishing in quality.

WOUNDS OF THE CHEST

The chest-wall may be penetrated in several ways, the most common of which are stab and gunshot wounds, and injuries inflicted by the ends of broken ribs. Wounds that do not extend entirely through the chest-wall, making merely a flesh wound are termed non-penetrating.

Wounds that enter the pleural cavity and perhaps the lung, are often fraught with considerable danger, by admitting air into the pleural cavity (pneumothorax), besides endangering the lung tissue and pleural cavity by the entrance of septic germs; the former condition likely eventuating in pleural distention

and the latter in purulent pleurisy or empyema. The symptoms of an existing pneumothorax are dyspnea, rapid respirations, coughs, dullness or absence of the respiratory sounds, and a marked resonance on percussion over the affected side.

If a condition of empyema exists there will be, in connection with most of the symptoms enumerated in pneumothorax rigors and hectic flushes that indicate the absorption of pus to a greater or less extent. Should some important blood vessel be severed and blood escape into the pleural cavity the morbid condition is termed hemothorax, the symptoms indicating the unnatural state being in the main those observed in hydrothorax, viz: cough, shortness of breath, rapid respiration, dullness on percussion and flatness of the chest-wall over the area affected. In cases where the hemorrhage is extensive into the pleural cavity, such other symptoms may supervene as feeble heart action, pale features, sighing respiration, syncope and collapse.

Traumatism, affecting the walls of the chest, that is nonpenetrating may present no special symptoms other than soreness and pain; hemorrhage may be slight and easily checked.

The flow of blood is generally more active following stab wounds than is observed in gunshot injuries; this is perhaps due to the mangling of the tissues in the latter injury, especially if the missile is large and fired at slow velocity.

The treatment of wounds in the wall of the chest will depend largely upon the symptoms presenting in the individual case. The general rule is to avoid deep probing of the wound when the latter is penetrating and devoid of serious symptoms, thereby lessening the chance of infection if it does not already exist. It will be good treatment to put the patient to bed and advise him to be quiet.

The movements of the chest-wall should be limited by the application of a wide bandage after the wound has been cleansed and covered over with an antiseptic dressing. If the condition of pneumothorax exists the pent up air is soon absorbed, following the form of dressing advised above; even blood that finds its way into the pleural cavity eventually becomes absorbed if infection does not take place.

If symptoms of infection develop in deeply penetrating wounds, the latter should be enlarged under antiseptic meas-

ures and thoroughly cleansed of foreign matter and ample drainage provided, perforated rubber tubing being the medium usually preferred. To reach the depth of most penetrating wounds and to dilate the track a uterine dressing forcep can be utilized to a good advantage. In all cases where it becomes necessary to open up a wound in the chest-wall, all hemorrhage should be arrested before applying the external dressing.

In extensive wounds of pleura and lung it often becomes necessary to remove a section of one or more of the overlying ribs together with extensive incision of the soft parts in order to reach the bleeding points, which, when located should be picked up and ligated or clamped if possible; otherwise the hemorrhage may be held in check by packing the wound to its depth, if possible, with strips of sterile gauze, using caution to have the plug exert the necessary pressure against the bleeding vessel. Complications must be met as they arise.

Nourishing foods and tonic remedies should be advised to maintain the patient's strength.

PNEUMOTHORAX

Pneumothorax signifies the presence of air within the pleural cavity. The principal causes of the abnormal condition are wounds of the pleura from without, as stab or gunshot injuries, or from within as a result of abscess or other diseases of the lung involving the pleura in the morbid process. It may also be produced by the fractured end of a rib being forced through the delicate membrane.

Stab wounds that merely puncture the pleura give but little disturbance to respiration as the traumatism at once closes, shutting out the air. More serious is the effect to the respiratory movement if the injury is extensive leaving an opening in the pleural membrane.

The symptoms accompanying this form of injury will vary in accordance with the extent of the traumatism in the individual case. Mild cases give but little trouble while severe ones will present periods of distressing dyspnea, cough, accelerated heart action and not infrequently the patient becomes

extremely cyanotic. Some cases will present a marked resonance over the area involved and auscultation will reveal a peculiar tinkling respiratory sound.

If the morbid condition is confined to one side of the thorax the chances for recovery are favorable under proper treatment, other conditions being equal; but a fatal termination may be looked for, in the majority of cases, where both sides are involved.

Under proper treatment mild cases soon show a tendency to recovery. Of the utmost importance is the necessity of sustaining the patient's strength by the administration of stimulants and tonics and the taking of nourishing food. In ordinary cases the opening in the pleural membrane soon becomes closed following which the pent-up air soon undergoes decomposition and is dissipated or absorbed.

If the pleural cavities are found to be greatly distended with air the same should be allowed to escape by aspiration or through the medium of a trocar and canula.

PULMONARY EMPHYSEMA

Emphysema of the lungs is occasioned by a dilatation of the air-vesicles with gas or air with a loss of the normal elasticity of lung-substance. There are several varieties of the affection enumerated according to the part of lung structure involved; hence there is the **vesicular variety,** affecting the small bronchi and alveoli, determined by dyspnea, enlargement of the chest-walls, and giving marked resonance on percussion; **compensatory emphysema** where a part of the lung only is affected, the remaining portion being normal and doing the work for the entire lung by a more rapid respiration; **Interstitial emphysema** where the air cells rupture from distention, permitting the gas or air to escape into the surrounding tissue. This form of the morbid condition is frequently observed in wounds and gangrene of the lungs.

The **atrophic variety** mentioned by some authors, in the old and infirm is seldom met with in general practice,

it is characterized by atrophy of the organ with a dilatation of many of the air-cells.

The usual symptoms accompanying emphysema of the lungs are dyspnea, cough more or less distressing, the raising of tough and tenacious mucus, rapid labored respiration, rapid pulse, cyanosis of the lips in severe cases, attended with marked physical weakness. Inspirations are generally short and expirations prolonged and not easily noted.

The etiological factors to be considered in connection with the morbid condition of the lungs are violent and forceful respiratory efforts and the unyielding state of the chest-walls, frequently observed in old and enfeebled individuals.

Treatment: The medicinal treatment of emphysema of the lungs will depend particularly upon the indication for drugs. In the acute stages of the disease where the pulse is slow and seemingly labored, with the patient dull, stupid, pupils dilated, and other evidences of congestion, belladonna will be indicated, associated with such other remedy as will relieve the dyspnea; for this phase of the ailment Spc. Lobelia will generally prove efficient. The prescription should be written as follows:

R.
    Spc. Tr. Belladonna .... gtt. xij
    Spc. Tr. Lobelia .... gtt. xx
    Camphor Water, q. s. ....fl. 3 iv
 M.   Sig.—A teaspoonful every hour or two.

If the heart sympathizes with the lung disease, resulting in marked dyspnea and precordial oppression and pain, the above prescription should be alternated with the following mixture:

R.
    Spc. Tr. Cactus Grand. .... 3 j
    Spc. Tr. Crætagus .... 3 iij
    Peppermint Water, q. s. ....fl. 3 iv
 M.   Sig.—A teaspoonful every two hours.

Digitalis will be indicated in feeble heart action as will strophanthus if the weakness is associated with pain, dyspnea, and palpitation.

During the time the patient is undergoing treatment he should be kept at rest in bed upon a spare but stimulating diet suited to the individual case.

In cases where rigidity or the unyielding state of the chest-

walls appears to be the exciting cause of the emphysema, resection of the cartilaginous ends of two or more ribs on either side will give immediate expansion to the chest wall and in this way relieve the distressing symptoms accompanying the lung disease.

The operative work should be done under local anæsthesia if possible with strict antiseptic precautions to prevent infection.

PLEURAL EFFUSION

Effusion of fluid into the pleural cavity frequently follows inflammation of the pleura, the presence of tumors and foreign bodies, pneumonia, and stab and other wounds. The fluid may be mostly serum, following pleurisy; principally water, caused by dropsical affection; pus (empyema), blood from traumatic causes, and erosion of tuberculosis.

The symptoms will vary in accordance with the exciting cause, and the amount of fluid collected within the pleural cavity. Dyspnea and dullness on percussion are symptoms common to nearly every case; cyanosis and bulging of the interspaces are symptoms indicating a considerable collection of fluids and is usually accompanied by a considerable cough and immobility of the side affected. If the fluid becomes purulent through infection, the patient will have hectic fever, preceded by rigors, the tissues of the chest walls become edematous and the respiratory sounds are markedly decreased. With the ear to the chest over the affected area, a gurgling of fluid is plainly detected during respiration and the patient often coughs up muco-pus, exceedingly offensive to the sense of smell. The heart action is weak and rapid and the patient is usually restless and sleeps but little. Thirst is generally a feature of the morbid state and the desire for food is decidedly limited.

Treatment: As soon as the presence of fluid within the pleural cavity is determined, it should be evacuated without delay, either by the trocar and canula, the aspirator, or by free incision and the placing of a drainage tube within the purulent cavity.

Instruments needed to execute the different operations generally required in the worse phases of the disease are a bistoury,

scalpel, bone forceps, trocar and canula, aspirator with vacuum-jar, hypodermic syringe and rubber drainage tubing of various sizes.

If it is decided to evacuate the fluid with a trocar and canula, the site is selected and a punctured incision is made through the skin with the point of the bistoury, through which the trocar and canula are thrust into the purulent cavity; the trocar is then withdraw, when the pent-up fluid freely escapes through the canula; as it does so the depressed lung expands, thus aiding a free evacuation of the fluid. If the fluid be thin and serum-like, once tapping may be sufficient, while purulent conditions may require two or more like operations.

The aspirator is advised by some operators to withdraw the abnormal fluid with a view of preventing air from entering the pleural cavity if possible; however little harm is experienced from this source if proper attention is directed to sustaining the patient's strength and treating the suppurating area with strict asepsis. Directions in the use of the aspirator are given under the head of aspiration in another chapter in this book to which the reader is referred.

In cases where the purulent fluid is too thick to be readily removed with the trocar and canula or aspirating needle, an incision should be made through the intercostal space and on into the purulent cavity, being careful not to wound the inter-costal artery that is found along the lower border of the rib. If the nature of the case requires it a piece of gauze drainage should be placed through the wound and into the cavity while the latter is being freed of its contents.

These operative procedures may be executed without pain by benumbing the tissues with a four per cent solution of cocaine administered with a hypodermic syringe.

While the patient is undergoing treatment for the pleural disease, stimulants and tonics should be given in liberal doses and a nourishing diet prescribed.

PARACENTESIS OF THE THORAX

Effusion within the pleural cavity of pus, blood, chyle, and serum often brings on such distressing attacks of dyspnea that

tapping the thoracic cavity and evacuation of the fluid is required to save the life of the patient.

The morbid state is usually the result of inflammation and this in turn is intensified by acute and chronic ailments, as pleurisy, pneumonia, phthisis, tumors, foreign bodies, gangrene and traumatism.

The prominent symptoms accompanying marked cases of effusion within the pleural cavity are dyspnea, dullness on percussion, a seemingly displaced apex beat of the heart, cough, a bulging of the intercostal spaces, cyanosis, with rigors and hectic flushes if the pent-up fluid be purulent in character; abnormal respiratory sounds are heard during auscultation due largely to the changing of fluid from one area to another. Often a state of œdema exists in the muscular structures about the chest walls, especially if the effused fluids be purulent. Pitting by pressure with the end of the finger is produced over the walls of the chest.

Treatment. The fluid is usually located at the lateral and posterior part of the chest and is reached by introducing a trocar and canula between the seventh and eighth ribs. The instrument need not be a large one to allow the escape of the effused fluid, unless it be purulent in character and very thick; such cases may require an incision made down through the middle third of the intercostal space and parallel with it and into the pleural cavity, care being taken not to wound the intercostal artery which courses along the lower border of the rib. The incision may not be more than one and a half inches in length, keeping close to the upper border of the rib, the finger in the wound being used as a guide in the operative work.

The pleural cavity should not be washed out following the evacuation of the fluid except in marked cases of purulency; such cases require that the wound be kept open for a few days to permit of drainage, using sterile cotton and gauze as a dressing during this period. If the fluid is drawn off through a canula, the punctured wound can be sealed shut at once with gauze and collodion.

The slow evacuation of the fluid through the small canula will guard against the admission of air within the pleural cavity by a gradual expansion of the lungs.

Hemothorax is an accumulation of blood in the pleural cavity nd is due to stab or operation wounds in the chest walls, where he external opening becomes occluded, preventing the escape f the sanguineous fluid. Besides the usual symptoms of pleural ffusions there are added those of internal hemorrhage; rapid ulse, pale features, restlessness, yawning, nausea, cold sweat, ollapse and death.

If the first symptoms observed grow progressively worse. he wound in the chest walls should be enlarged, the pleural ffusion which often contains coagula, allowed to escape, aided y placing the patient on the side which the incision is made. rging him to take slow and deep inspirations. The external vound should be kept open to permit of drainage till all decom- osing fluids have escaped. During the time that drainage is rofuse, the patient's vital powers will need sustaining with timulating agents and nourishing and appetizing foods. Eggs, eef, milk, custards, the juices of canned fruits, ice cream, wine, vhey, koumiss, lemonade, lemon or pineapple sherbet and sips f sparkling wines are suggested here.

Emphysema is due to the escape of air into the cellular issues. It is often a prominent symptom accompanying hemo- horax; it then occurs from penetrating wounds of the lungs. The wound in the skin and muscles becomes occluded when due to external violence, shutting off this avenue of escape, air is forced into the loose tissue of the lung or subcutaneous tissue about the walls of the chest. The splintered end of a fractured rib may be driven into the lung or bronchi allowing the escape of air into the surrounding tissues.

Symptoms in mild degrees of emphysema may be mostly absent; in pronounced cases, dyspnea will be a constant feature f the affection, respiration may be chiefly abdominal. Cough s a marked symptom when the bronchial tubes are involved ind is asthmatic in character. The heart action is irregular ind the patient often complains of vertigo. In diffusive emphy- ema, a pronounced crackling sound is produced by passing the and over the body surface under moderate pressure. In seri- us cases the body is made to assume an enormous size, and the danger to life is pronounced from interference with respira- tion and the circulation.

The treatment consists in keeping the patient at rest in bed, usually respiration is easier if the head is kept high, avoid excitement, and relieve distressed conditions by the indicated remedy. An excellent compound for the bronchial cough is the following:

 R.
  Sulph. Morphia .... gr. ij
  Tr. Capsicum .... gtt. x.
  Chloroform Water .... fl ℥ iv
 M. Sig.—A third to a half teaspoonful only when cough is
  severe.

The diet should be mostly fluid and nourishing, avoid fruits and articles of food likely to provoke tympanites. Drop doses of arsenic, taken in a small teaspoonful of elixir glycero-phosphate of lime and soda, with the meals serves as a potent tonic, as do small doses of strychnia taken in some palatable form.

The surgical treatment consists in placing a gauze and collodion dressing over the wound, or a gauze compress and bandage to hold it in place. Should the morbid state result from a broken rib, the fracture should be adjusted and adhesive strips applied over the injured side of the chest to restrain motion.

Punctured wounds are made in the skin and fascia over areas greatly distended with air in diffused states; in moderate cases the air may become decomposed within the tissues and give no further trouble.

PARACENTESIS OF THE PERICARDIUM

Effusion in the pericardium giving rise to marked respiratory distress and cyanosis gives cause for operative procedures to bring relief.

Normally the pericardium is in contact with the sternum, but does not extend below it; effusion in the cavity causes it to extend downward and usually to the left of the normal position.

Kocher's method of tapping the sac is preferred by most operators on account of it being unnecessary to expose the peri-

cardium, but to a small extent, and the simplicity of its execution.

The patient prepared and under chloroform an incision is made on a line of the sixth costal cartilage and extending from the middle of the sternum outwards on the left side to the extent of three or four inches; the tissues are divided layer by layer down to the bone, using the finger as a guide on approaching the intercostal space. Dissect back from the sixth costal cartilage, the perichondrium and muscular structure and excise the cartilage from the sternum. This exposes the triangular muscle of the sternum and mammary vessels which are ligated if necessary. Divide with the handle of the scalpel the tendenous insertion of the triangular muscle to the sternum, this done and the divided structures retracted, the glistening pericardium is brought into view, when it can be tapped, the fluid evacuated which completes the operation.

GANGRENE OF THE LUNGS

Gangrene of the lungs sometimes follows traumatism, pneumonia, pyæmia, and the presence of foreign bodies, and such constitutional diseases as diabetes, tuberculosis, nephritis, and such other ailments as deplete the system. Pulmonary embolism is given as a common cause of the morbid state. A history of the case will aid materially in arriving at a correct diagnosis.

The characteristic symptom of the morbid condition is a periodical rise of temperature during its early stages, with a subnormal temperature, after death to a portion of the lung, has notably occurred. Cough is a troublesome feature of the ailment, the patient raising at times a considerable amount of muco-purulent exudation which is often blackish in appearance and will disintegrate if placed in water, a portion of it settling to the bottom of the container. The breath is very offensive from the foul odor of necrotic tissue and the contaminated saliva leaves a disagreeable sweetish taste in the mouth. The pulse is weak and rapid, showing physical prostration. The appetite is poor and digestive disturbances common. Pain is seldom experienced, but hemorrhages occasionally occur that further deplete the patient.

Treatment: Outside of supporting the patient's strength, remedial agents accomplish but little in the treatment of this serious ailment; something can be accomplished by way of controlling the foul odor emanating from the lungs, by taking an occasional dose of creosote in syrup or glycero-phosphate of lime and soda; or by inhalation, saturating cotton in a glass inhaling tube through which air is inhaled. Air saturated with a spray composed of spirits of turpentine and camphorated oil, or eucalyptus oil and alcohol, equal parts, and inhaled will prove beneficial.

As a tonic and stimulant to wasting energy, the following mixture serves the purpose well:

R.
   Fowler's Solution .... $\mathfrak{z}$ j
   Elixir Glycero-phosphate of Lime and Soda, q. s. . . fl. $\mathfrak{z}$ vj
   M. Sig.—A teaspoonful taken in a wine-glassful of cold water
   every three hours.

Other tonic remedies worthy of mention are strychnia, and acid solution of iron in two drop doses in water, spc. tr. phosphorus, and the compound tincture of cinchona bark.

A harassing cough may be held in check with small doses of the following mixture:

R.
   Sulph. Morphia .... gr. j
   Spc. Tr. Capsicum .... gtt. x
   Chloroform Water, q. s. ....fl. $\mathfrak{z}$ iv
   M. Sig.—Taken as directed.

Peppermint and menthol taken in the form of lozenges will aid largely in relieving cough.

Operative treatment consists in opening up the chest walls sufficiently to approach the affected lung area, packing well with sterile gauze on the exposed sides of the necrotic portion of the lung, which will also serve as ample drainage during the time that the diseased portion is sloughing away. After this has taken place the cavity should be kept free by gauze drainage, using no fluids to accomplish this end.

The diet should consist of rich soups and broths, broiled steak, eggs, custards, ice cream, milk and cream, fruit preserves, jellies, fruit juices and eggnog.

HERNIA OF THE LUNG

As a result of deficient development of the ribs, traumatism, degenerating disease of the chest walls and violent occupations, hernia of the lung sometimes takes place. A protrusion of the lower lobe of the lung may also escape through a rent in the diaphragm during violent straining or coughing.

When the protrusion takes place through the costal interspaces the common symptoms accompanying the unnatural condition are the bulging outward of the overlying tissues and more or less distress at the point of the rupture. The hernia through the diaphragm generally provokes an irritative cough and internal discomfort that is hard to account for, not being able to approach the seat of the trouble. Owing to the nature of this form of hernia, it gradually grows larger and the symptoms more aggravated as time passes.

Intercostal hernia is reducible, while that through the diaphragm may not be, as adhesions frequently form between the lungs and the borders of the rent in cases of long standing.

Treatment: The treatment of the intercostal variety, without other complications, will be by bandaging or strapping, first placing a suitable compress over the protrusion; these measures will prove merely retaining and should be constantly resorted to that relief may be constant.

The treatment of hernia through the diaphragm will be entirely surgical A laparotomy should be done and the rent located which should be closed if the protruded portion of the lung can be reduced, otherwise the morbid state should be managed as the individual case will suggest.

THORACOTOMY

Opening the chest walls by removing a portion of one or two ribs for the purpose of evacuating purulent fluids or extravasated blood from the pleural cavity is denominated thoracotomy. The opening is extended when it becomes necessary to remove a portion of the diseased lung or growth in the chest wall.

At one time pleural fluids were evacuated through a simple incision extending through the skin, fat and fascia and the muscular structure between the ribs, following by inserting one or possibly two drainage tubes through the opening and into the pleural sac, but this method does not provide as thorough drainage as does excision of a portion of one or more ribs, hence it is not often executed except in the young and persons of a very feeble constitution.

If it is desired to resect a portion of a rib, the chest should be rendered aseptic in the usual manner. The operative work can be done under local anæsthesia, unless the patient is nervous and excitable, in this case chloroform should be administered.

After determining the point at which the opening is to be made, an incision, three inches or more in length, is made down to the rib in its long axis. The margins of the wound are retracted and the periosteum dissected free from as much of the rib as is found necessary to remove; this is done with the periosteotome after making a cross incision in the periosteum at about the middle of the portion of the rib to be removed, caution being taken not to enter the pleural cavity while doing this part of the work. About an inch and a half of the rib is then cut away with strong bone cutting forceps, or costotome, exposing the bulging pleura, which should be incised, allowing the pent-up fluid to escape into a pus pan or other suitable vessel.

If one or two drainage tubes are inserted, they should be of rubber and just extend within the pleura and prevented from slipping into the abscess cavity by passing through them a safety-pin. The after dressing consists in keeping the wound clean with antiseptic washes and the application of loose sterile gauze dressings held in place with gauze bandages. The abscess cavity is not to be syringed or washed out when redressed with any kind of antiseptic fluids. To aid in thorough drainage the patient should be instructed to occasionally lie on the diseased side.

If cough becomes a troublesome feature, take note of the condition of the drainage tube; it may be pressed against the lung tissue, if so it must be shortened. In executing the operative work, care should be taken not to wound the intercostal arteries that rest along the lower edge of the rib. Severe neural-

gic pain is sometimes provoked from pressure on the intercostal
nerve by a too large drainage tube, in this case a smaller and
softer one should be substituted The margins of the external
wound should be approximated and sutured with silk-wormgut
on either side of the drainage tubes.

DISEASES OF THE MEDIASTINUM

The mediastinum or median septum, between the lateral
cavities of the thorax, is subject to traumatism, and morbid
growths, such as carcinoma, sarcoma, and tuberculous affections.
Crushing injuries to the chest walls, involving the mediastinum,
usually injure the heart, blood-vessels, and other important
organs to the extent that death quickly ensues.   Gunshot
wounds to this region are always serious and liable to end fatally.
If the œsophagus or trachea becomes injured by the leaden
missile, symptoms of a serious nature will develop at once;
either empysema or inflammation of an infectious character
soon develop.

The symptoms of a developing tumor in the median sep-
tum are quite obscure during the early stages, and not until the
growth becomes sufficiently large to produce distress from pres-
sure, will the morbid condition be suspected.

Treatment: Not much relief can be expected from medi-
cinal measures in these cases. The nature of the individual case
will have to determine the course to pursue. Palliative treat-
ment can only be suggested in crushing injuries, while the
patient is kept at rest in bed.

Should there be an accumulation of blood and other fluids
behind the sternum, following fractures and gunshot injuries, the
same should be evacuated by aspiration, as soon as its location
is determined. The hemorrhage may be controlled, if not from
the large blood-vessels, by the internal administration of witch-
hazel, pounded ice, ergot, morphia, and adrenalin chloride solu-
tion; the last three agents should be used hypodermically in
graduated doses to meet the requirements of the individual
case.

The fluid of a cystic tumor may be evacuated through an

exploratory opening in the sternum, made with a trephine or a chisel and bone cutting forceps.

Benign growths sometimes form in the median septum, but owing to the nature of the contiguous structures, they are exceedingly difficult to remove by dissection; however, the operation has been successfully executed.

AXILLARY ABSCESS

Abscess forming in the lmyph-glands of the axillary space frequently follows infection from disease or suppurating injuries to the adjacent parts. The suppurating fluids from these nodes coalesce and often burrow deep in the loose tissues surrounding them.

No great disturbance is noted in connection with the morbid condition until the collection of purulent fluid is extensive enough to produce pressure pain, however there may be tenderness on pressure over the parts involved during the progress of the disease.

Treatment: The character of the treatment will be evident as soon as the nature of the disease is determined. The overlying structures are opened up, evacuating the pent up fluid and dissecting out all of the necrotic tissue that it is possible to remove, care being taken not to injure the important nerves and blood vessels that traverse the axillary space. In closing the wound, space should be left for drainage. The subsequent dressings should consist of antiseptic solutions, sterile gauze pads and bandages. The general health should be maintained with peptics and tonics together with good nourishing food.

HYDROTHORAX

The term hydrothorax signifies an effusion of fluid in the pleural cavity. The morbid condition is generally the result of pleuritis or an attack of pneumonia. It may also occur from the presence of foreign bodies and tumors, traumatism, and septic infection. The characteristic symptoms of hydrothorax, es-

pecially in pronounced cases, are dyspnea, distressing cough, pain, bulging of the intercostal tissues, and edema of the same,. diminished resonance over the affected area, respiratory murmur dull, and the heart action accelerated and feeble. In mild cases many of these symptoms may be absent or appear in a mild degree.

Treatment: The treatment of mild cases consists in the administration of such remedies as favor elimination of fluids; for this purpose it is well to commence with the saline carthartics which should be given to free catharsis, followed by some of the active diuretics such as sweet spirits of nitre, infusion of juniper berries, gin, and cantharides; spirits of turpentine may be given in three drop doses on sugar every two hours and applied to the chest morning and evening to good advantage. If relief is not obtained within a reasonable time from the remedial agents above mentioned and the chest becomes well filled with fluid, tapping or aspirating the surplus serum away should be done without delay. A trocar and canula of medium size is a suitable instrument to use in cases where the pent up fluid is heavy or contains flocculent matter large enough to block the end of an ordinary aspirating needle. In absence of either of the above intruments the fluid may be let out through an incision made in the intercostal muscles with a narrow bladed bistoury. To aid the flow of the purulent fluid the beaks of a uterine dressing forcep should be inserted through the incised wound and spread, thereby enlarging the opening; to be sure air will enter the pleural cavity, but it will be eventually expelled through the external incision as the lung gradually expands.

The patient's strength must be maintained by stimulating and nourishing fluid foods, such as hot soups and broths, gruel, malted milk, koumiss, and sips of iced champagne and ice cream in small quantities in feverish states.

Complications must be treated as they arise.

PART NINE

Lesions of the Blood Vessels

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ENDARTERITIS

Endarteritis is a morbid state of the coats of the arteries, brought about by continued inflammation. The inflammatory process usually commences in the inner coat of the artery and gradually extends to and involves the outer or fibrous coat of the blood vessels. Two forms of the morbid process are recognized by pathologists, the **obliterative** and **atheromatous**. The latter is very frequently met with in general practice, especially in the aged and among those who are suffering from some of the phases of syphilis and nephritis. Individuals addicted to the use of alcohol are subject to the disease.

Owing to the fatty degeneration that the inner and middle coats undergo, portions of the affected area occasionally become detached, leaving a raw or ulcerative surface, weakening the vessel at that point to a greater or less extent. Not infrequently a thin crust or calcareous matter is found covering over the parts involved in the process of degeneration, that may block the lumen of the blood vessel, should it become detached in one large piece or several smaller ones at the same time. Aneurism not infrequently occurs at the point where the coats of the artery become attenuated by the morbid process above alluded to.

The obliterative form of the affection is generally due to some active systemic disease that affects chiefly the circulatory sytsem; syphilis is perhaps responsible for the morbid condition more frequently than all other diseases combined.

The smaller arteries are more frequently affected than are the larger trunks, except it be at the bifurcation of the larger vessels. In this form of the degenerative disease, the narrowing of the lumen of the vessels is more general than in the atheromatous variety.

In pronounced cases of the obliterative form of the disease, the arterial tension naturally becomes increased, frequently resulting in morbid changes in the heart, chief of which is hypertrophy of the organ.

Treatment: In prescribing a treatment for this morbid affection of the blood-vessels, the cause should first be sought and removed, in so far as possible, and if this can be done in the early stages of the disease, some benefit will result from right food and remedial agents properly administered.

Individuals suffering from either form of the disease seldom do well on a meat diet or stimulating drinks like strong tea, coffee and especially alcoholic beverages. A general vegetable diet is usually permissible and a milk diet in most cases. Rice and the other cereals can be partaken of sparingly and the meat of fowls can be eaten occasionally.

The function of the kidneys should be stimulated with citrate or acetate of potash, these medicinal agents may be alternated with benzoate of lithia to a decided advantage to the patient. Ammonium citrate of iron in three to five grain doses every four hours will be indicated in anemic cases, with deficient kidney action. Small doses of Fowler's solution of arsenic and phosphorus should be thought of in physically weak individuals. Frequent bathing in sulphur springs water will be of decided benefit to the patient and outdoor exercise is essential to recovery from the morbid disease.

Organic diseases responsible for the disease of the blood vessels should be treated as the specific indications direct.

ANEURYSM

The pouch-like dilatation of some parts of an artery, or the equal expansion of the entire circumference of the same, is termed an aneurysm. The former is classified as the sacculated variety, and is usually the result of a weakness of the arterial wall; the pouch-like process of greater or less dimensions is developed on one side of the artery and is connected with the lumen of the blood vessel by a slit-like orifice. The latter form is termed fusiform, and is a general dilation of all the coats

of the artery, involving the entire circumference of the blood vessel.

Aneurysm resulting from injury to the coats of an artery is spoken of as traumatic; if it occurs from unknown causes, it is called spontaneous aneurysm; and cases where the pouch or sac ruptures, spilling the blood out into the tissues, is still another form, called the diffused aneurism.

The causes of this morbid state of the artery are various; persons addicted to drink, and those suffering from chronic functional diseases, are predisposed to the ailment. It is said that inflammatory diseases that reflect upon the coats of the artery are provoking causes, as well as injuries received from cuts, punctured and gunshot wounds. Atheroma and embolism are also common causes.

The aortic, carotid and popliteal arteries are the most frequently affected. The pressure of an aneurysm frequently results in erosion, œdema, nervous irritation, paralysis and gangrene.

A spontaneous cure may occur by the deposit of fibrin, layer upon layer, on the inner walls of the sac, until the aneurysmal pouch becomes that of a fibrous tumor; or the sac may become the seat of a clot of blood, which in time, becomes so completely organized as to entirely obliterate the pouch-like process; or from the results of inflammatory action, the sac may soften and rupture, the blood forming clots in the artery above and below the ruptured portion.

The first symptoms of aneurysm are muscular weakness, swelling and more or less pain in the affected part. An examination will disclose a pulsating tumor along the course of the artery. If sufficiently superficial, the artery can be compressed above the tumor with the fingers, when the pulsation ceases, and the tumor gradually lessens in size; when the pressure is removed the tumor immediately reappears. A diagnostic feature of the morbid state, is the blowing sound, or bruit, distinctly heard by the aid of the stethoscope.

Indications of a "spontaneous cure" are a lessening of the tumor mass, a decrease of the pulsations, the part becomes more firm, with more or less pain in and near the tumefaction. Should the aneurysm suddenly rupture, the effect will depend

upon the size and location of the injury; should it empty into a serous cavity, death rapidly follows; if into the bronchi or trachea, there will be hemoptysis, and vomiting of blood should it empty into the stomach.

A tumor or an abscess forming over an artery may have many of the characteristics of an aneurysm, but the bruit is absent, and the mass does not expand during the pulsation, nor does compressing the artery decrease the size of the swelling.

Treatment: Internal treatment will bring about a cure, if certain restrictions are strictly observed, in many cases. Absolute rest in bed, with a diet composed of such foods as will reduce the volume and increase the density of the blood, is strictly enjoined. Bread and butter, milk, crackers, toast, potatoes, meat without salt, and rice, are permissible in small quantities. In fact, the more the patient refrains from eating, the sooner a cure is brought about. Fluids must be taken sparingly. Acid drinks, such as lemonade, dilute phosphoric acid, and the juice of lime fruit, will slack thirst and are taken with a relish. All drinks and food should be fed the patient by a nurse, as. no exertion is permitted on his part, not even to rise to the sitting position. These restrictions may seem to work a hardship to the patient, but if the necessity of their observance is clearly explained, there is usually no trouble to secure a hearty co-operation on his part. As remedial agents, digitalis, specific tincture of veratrum, and iodide of potassium in five to ten grain doses, three times a day, exert a beneficial influence by slowing the heart action, thereby diminishing the blood pressure in the aneurysmal mass. The iodide of potassium is specially indicated if a history of syphilis has been given. In external aneurysm, mechanical measures in connection with the internal treatment, will be of great utility. Pressure upon the artery between the tumor and the heart by a compress, held in position by strips of adhesive plaster or bandage, should be first given a trial; and in the event that this method proves ineffectual, the artery should be cut down upon and ligated on the proximal side of the tumor whenever this procedure seems practicable, care being taken not to apply the ligature too close to the tumor.

It is questionable whether the methods of cure by galvanopuncture, coagulating injections, the introduction of wire or

horse-hair, have established results favorable to their commenda-
tion; the fact alone remains that the characteristics of the indi-
vidual case must determine the nature of the operative pro-
cedure.

The operative technic in ligation of the artery, is as follows:
After the skin surrounding the tumefaction has been rendered
sterile, an incision is carefully made down to the sheath of the
artery; after the same has been exposed by the use of the groov-
ed director, an aneurysmal needle armed with a double silk lig-
ature is carefully passed under the artery, disturbing the parts
as little as possible; the loop of the silk strand is cut near the
needle, leaving two ligatures beneath the blood vessel, which
are carefully and securely tied about three-eighths of an inch
apart, sufficiently tight to approximate the inner tunic of the
artery; the ends of the silk strands are cut short and the wound
in the skin and fascia is united with two or three interrupted
catgut sutures and dressed with antiseptic gauze, bandaged and
the part placed at rest in an elevated position. For the next few
days the part may appear swollen, and the pulsation so marked,
as to lead the surgeon to think that his work has been of no
avail, but gradually these local inflammatory conditions subside,
and the aneurysmal mass begins to assume something of a nor-
mal appearance.

Should secondary hemorrhage, or gangrene, ensue, as a re-
sult of the operative work, it is better to amputate the limb
without delay.

A dilatation of one or several closely situated superficial
arterial branches, which often forms a pulsating mass, varying
in size, is called a crisoid aneurysm. The morbid condition may
appear on any part of the body, but it is most frequently ob-
served about the head, face, or neck.

If a single artery is affected, it becomes tortuous and en-
larged for a considerable length, and where several arterial
twigs are involved, the affected portion is shorter, often form-
ing an abrupt growth. There are no pronounced symptoms ac-
companying the affection, other than the presence of the tumor
and its pulsating nature, and its usually bluish appearance.
By the use of the stethoscope, an audible bruit is readily ob-
tained, and the outline is irregular. The nearby veins extending

into the tumor mass are generally found distended with blood and more or less tortuous, The appearance of these vascular pulsating masses about the face and head, while not painful, is unsightly and makes the wearing of head gear uncomfortable.

The treatment of this variety of aneurism is by ligation and excision, when the location of the mass is where such an operation would be feasible.

The treatment by compression is in most cases a failure. and injecting the mass with persulphate of iron or other astringent agents, with the view of constringing the blood vessels, accomplishes but little, if any lasting benefit.

LIGATION OF ARTERIES

The ligation of arteries is required to control hemorrhage, to cut off the supply of blood to rapidly developing tumors, and in the surgical treatment of aneurysm. To successfully execute the work the operator must have an intimate knowledge of the location and general course of the vessel, the possibility of its anastomoses, and its relation to other important blood vessels and nerves. A familiarity with the anatomical relationship of the trunks of the large arteries to certain muscles, bony eminences and joints, will aid greatly in locating the vessel to be ligated.

If the operator has the choice of location for tying off the vessel, he should not place the ligature in close proximity to a large branch, as firm clots are frequently prevented by the active circulation of blood. .

In cutting down upon the artery, the incision should be made along the line of the vessel, through the skin and fascia and of ample length to facilitate the search for the artery which is usually located by its pulsations felt by the finger. After the skin and superficial fascia have been incised, much of the underlying tissue can be separated by a director or handle of the scalpel. Approaching the artery the fibrous sheath should be opened to permit of the placing of the ligature with the aneurysm needle; this done the wound is to be closed in the usual manner and the limb kept at rest for two or three weeks. In passing the

ligature, great care is to be exercised not to include the accompanying vein or nerve; bearing in mind the macroscopical appearance of the artery in contrast with that of the vein; the former having a pinkish-white shining surface, while the vein is larger and presents a purplish color. A point worth remembering is that the large arteries are usually accompanied by one vein, the smaller arteries by two.

The ligatures should be fine silk or catgut antiseptically prepared, and strict antiseptic precautions observed in the post-operative work.

Instruments usually required in the ligation of arteries, are scalpels, artery forceps, dressing forceps, retractors, grooved directors, aneurysm needle, silk and catgut ligatures, needles and sterile dressings. All operative work should be done while the patient is under anæsthesia.

Ligation of the Aorta.

There is no authentic case on record where the patient survived the tying off of the aorta; yet every work on operative surgery seems incomplete without commenting upon the possibility of a successful ligation of the vessel. Aneurism, a common affection of the large vascular trunks, and traumatic injuries of the common iliac arteries might justify the effort to save life by ligating the aorta in its lower portion, just below the origin of the inferior mesenteric artery. This heroic operation has been executed a dozen or more times by some of the most skillful surgeons of the past but with fatal results in every case.

The linear guide to the aorta through the peritoneal cavity is the linea alba, and to the extraperitoneal course, a line extending from the apex of the first rib to a point within about an inch of the anterior superior spine of the ilium. To execute the work through the abdominal route an incision is made about five inches long in the median line, extending above and below the umbilicus. Carefully divide the several layers composing the abdominal wall down to the peritoneum, which is picked up with thumb forceps and incised to the extent of the incision in the overlying structures, having first controlled all oozing of blood from severed arterial and venous branches. Secure the edges of the peri-

toneum to the edges of the incised muscles with traction loops of silk-wormgut ; displace the intenstines to one side, and feel for the pulsation of the aorta with the finger. After its location is determined, the overlying peritoneum is divided with the finger-nail if possible, otherwise it is picked up with mouse-tooth forceps, nicked with the knife and then separated upon a grooved director. After exposing the aorta the ligature, which should be braided silk, is passed from left to right, and from behind forward cautiously avoiding the vena cava and the nerves that lie close to the artery. The operative work must be done as quickly as possible, and under strict antiseptic surroundings, with the temperature of the room a little above that of the body. Every precaution should be taken to guard against shock following the operation, by surrounding the patient with artificial heat. Avoid active remedial stimulation if possible, relying upon nourishing fluids, ice cream, and warm drinks, taken in small quantities to sustain the patient's strength. Absolute rest in bed for a period of three to four weeks should be enforced in this, as in all oper-ations of a similar nature on other large arterial trunks.

To approach the aorta by the extraperitoneal route, the incision is made along the line previously indicated, through the skin, superficial fascia, and underlying muscular structures down to the peritoneum, which, with the ureter and abdominal viscera is displaced upward and inward, exposing the aorta to view. To facilitate the passing of the ligature, the aorta is carefully raised with the finger or some curved blunt instrument; when placed and tied the ends are cut close to the knot and the external wound dressed as in other abdominal operations.

Ligation of the Axillary Artery

The axillary artery is a continuation of the subclavian, the vessel taking that name after it passes the lower border of the first rib up to the point where it terminates, at the lower border of the tendon of the teres major muscle. For the sake of convenience of description the artery is divided into the first, second and third portion. The vessel is seldom ligated in the first portion on account of the great depth at which it rests, and the danger of wounding some one of the adjacent branches of which there are many.

The muscular guides to the artery in the first portion are, first the line or border between the deltoid and the pectoralis major muscle; the deeper guide being the upper portion of the pectoralis minor muscle.

To reach the artery in this position an incision is made below the clavicle, extending outward from a point near the sterno clavicular articulation and penetrating the skin, superficial fascia, deep fascia, and exposing the deep costo-coracoid membrane; the pectoralis major muscle can be separated with a grooved director. In passing the ligature the surgeon must be cautious not to mistake one of the adjacent nerves or vascular branches for the artery; to avoid this blunder the surgeon should note the effect upon the pulse at the wrist as he tightens the ligature.

It is seldom necessary to ligate the axillary artery in the second portion of the vessel; if the existing conditions demand that the vessel be tied off in this portion, it can be reached through the incision made for ligation of the artery in the first portion of its extent. The same precautions must be observed not to injure the adjacent vessels or nerves as noted in the previous operation.

To approach the axillary artery in the third situation, the incision should be made a little anterior to a line dividing the axillary space centrally, accepting the inner border of the coraco-brachialis muscle as a guide. The tissues that cover the vessel at this point, are the skin, superficial and deep fascia, and a liberal amount of areolar tissue.

Before making the incision over the line of the artery, the arm should be abducted and rotated outward to bring the location of the vessel prominently into view. To approach the artery an incision two and a half or three inches in length is made in the skin and superficial fascia, the deep fascia, and the intervening tissue being divided with a grooved director or the handle of the scalpel. After exposing the artery, the ligature is passed from within outward, carefully avoiding the median nerve and axillary vein which will have to be drawn to the inner side to avoid being injured.

Accidental injuries, such as stab and gunshot wounds, gan-

grene, rupture, and aneurysm frequently call for the ligation of the axillary artery.

Ligation of the Brachial Artery

The brachial artery is the continuation of the axillary, and takes this name from a point on a line of the junction of the anterior and middle thirds of the axilla. It extends down the inner aspect of the arm to a point just below the elbow. The vessel not infrequently suffers severe injury owing to the many exposures that the arm is subject to.

The artery occupies the groove between the biceps and triceps muscles, and is covered in the upper third by skin and superficial fascia, with some cellular tissue between these structures and the artery. The inner edge of the biceps muscle is a
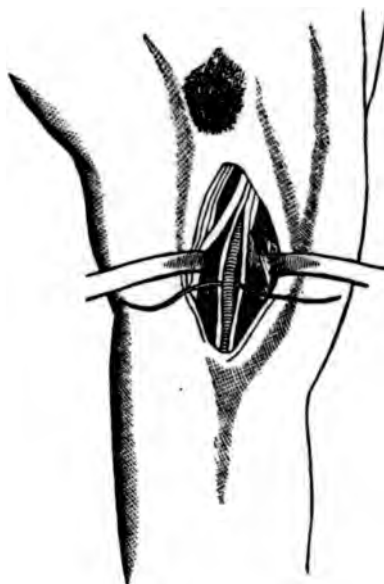
Fig. 56.—Ligation of the brachial artery in its upper third.

reliable guide to the artery. The median nerve, the basilic and venæ comites lies in close proximity to the artery in its entire length; in fact the former rests in the sheath with the artery. Expose the vessel in its sheath with a groove director, and pass the ligature with the aneurysm needle from within outward.

The artery is ligated in its middle third, through an incision made along the same muscular guide as was used in the operation in the upper third of the vessel. After exposing the artery in the sheath that surrounds it, the ligature is placed with the aneurysm needle, cautiously avoiding the accompanying vessels and nerves.

To facilitate the ligation of the brachial artery in its lower third, the incision is made along a line parallel with the inner border of the tendon of the biceps muscle; to reach the vessel it

Fig. 57.—Ligation of the brachial artery in its lower third.

will be necessary to divide the skin, superficial fascia, and the aponeurosis of the biceps. After drawing aside the median basilic vein the pulsations of the artery will determine its location. The ligature is passed from within outward, avoiding the vessels and nerves lying close to the artery.

In efforts to ligate the brachial artery, especially in its middle and lower portion, it will be well to note the fact that the vessel frequently bifurcates into the ulna and radial branches as high as the axilla, one branch resting, perhaps, very near the sur-

face, while the other will usually be found in the normal course. In approaching the artery through the enveloping sheath the same technique is observed that is followed in similar operations on other large arterial trunks, viz: the pinching up and raising of a portion of the sheath with mouse-tooth thumb forceps, which is then incised with the point of the knife to the extent of a quarter of an inch or more in line of the long axis of the artery.
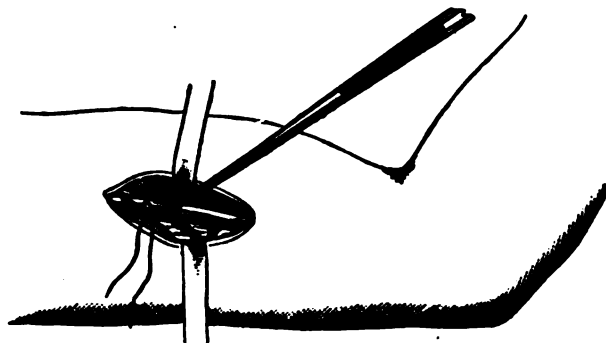
Fig. 58.—Ligation of the brachial artery in the middle third.

The edge of the opening on each side of the exposed artery, is grasped with thumb forceps and carefully separated and steadied while the ligature is placed with the aneurism needle, which is passed under the vessel, then armed with the ligature and withdrawn, one end of the ligature having been picked up and held with forceps, care being exercised not to disturb the artery more than necessary during the operative procedure. The smaller arterial branches have no distinct sheath, being surrounded merely by loose cellular tissue in most cases.

Ligation of the Common Carotid Artery

The common carotid artery is ligated just above or below the point where the omo-hyoid crosses the vessel which is about on a line with the cricoid cartilage. It is also quite easily reached in the superior carotid triangle which is above the omo-hyoid muscle. The muscular guide to the common carotid is the anterior border of the sterno-mastoid muscle, which is reliable except in anatomical misplacement of the vessel or muscle.

To reach the common carotid, an incision is made from near

the angle of the jaw to a little below the cricoid cartilage over the course of the vessel. The overlying tissues are the skin, superficial fascia, fat, platysma muscle. On reaching the edge of the sterno-mastoid muscle it should be pulled aside with a blunt hook, bringing into view the loose connective tissue that invests the artery; this is picked up with thumb forceps and opened with the point of the knife to the extent of a half inch, exposing the artery around which the ligature is passed with the aneurysm needle and tied; the first knot being drawn very tightly, the second not so tight. Great care should be exercised not to wound the internal jugular vein which lies to the outer side of the artery, and also not to include the pneumogastric nerve, which rests between the artery and vein, within the loop of the ligature.

Sterile catgut is generally selected for the ligation of arteries, and is tied with a square knot. The external wound is closed with catgut also. Should one of the adjacent veins be wounded during the operative work it should be clamped and tied at once.

Ligation of the External Carotid Artery

The external carotid artery is a branch of the common carotid, and leaves that vessel on a line with the upper border of the thyroid cartilage, and extends to the neck of the condyle of the lower jaw.

The muscular and linear guide to the artery is the anterior border of the sterno-cleido-mastoid muscle, and a line drawn from the sterno-clavicular articulation to midway between the angle of the jaw and mastoid process.

To reach the artery an incision is commenced at about the level of the hyoid bone and carried downward along the anterior border of the sterno-mastoid muscle for a distance of about two inches. The overlying tissues through which the incision is made are the skin, superficial fascia, fat, the platysma, and deep fascia, exposing the edge of the sterno-mastoid muscle, behind which the artery is found within its connective-tissue sheath, the pulsation of the vessel indicating its location. After retracting the sterno-mastoid muscle, and the superior thyroid, lingual, and facial veins, the loose connective tissue that surrounds the artery is picked up with mouse tooth forceps and

slit for a half inch or more with the point of the knife along the line of the artery, exposing it to view. The aneurysm needle

Fig. 59.—Ligation of the lingual, external carotid, and sub-clavian arteries.

armed with the ligature is then passed around the vessel from without inward, care being taken not to include the hypoglossal nerve within the ligature. Dress the external wound antiseptically.

Ligation of the Internal Carotid Artery

If the occasion arises that necessitates the ligation of the internal carotid artery, the vessel is approached through an incision guided by the same landmarks, and through the same overlying tissue that was severed in the ligation of the external carotid. The internal carotid is a continuation of the common, and bears about the same relation to the veins and nerves adjacent to it as does the common carotid artery. On exposing the artery through a snip in the sheath, the ligature should be passed from without inward, to avoid wounding the jugular vein.

Ligature of the Dorsalis Pedis Artery.

The dorsalis pedis artery is the continuation of the anterior tibial, and takes this name from the anterior bend of the ankle-joint to its bifurcation into the dorsalis hallucis and communicating branches.

It is usually tied near its origin where it is covered by the integument, the superficial and deep fascia. The tendon of the extensor proprius hallucis, the outer border, will serve as a

Fig. 60.—Ligation of the anterior tibial and dorsalis pedis arteries.

guide to the immediate location of the artery. The incision is made along the linear guide through the overlying structures, the artery separated from the veins which accompany it and the ligature passed around it from without inward. Dress the external wound antiseptically and place the limb at rest.

Ligation of the Deep Epigastric Artery.

The deep epigastric artery is a branch of the external iliac, and leaves that artery a little above Poupart's ligament. Its branches are distributed to the abdominal wall, femoral ring, and cremaster muscle. The vessel is to be reckoned with in operations for hernia and others involving the inguinal canal. Its course is upward and forward from its origin between the transversalis muscle and the peritoneum, passing along the inner

border of the internal abdominal ring. A line drawn from the umbilicus to the middle of Poupart's ligament will mark the course of the vessel above its origin. The epigastric artery is frequently severed by the surgeon while operating for the removal of tumors and other morbid states of the abdominal wall; also stab and gunshot wounds.

In case of accidental injury of the vessel through an open wound, the severed ends may be picked up and tied; but should the artery require ligating in continuity, an incision about three inches in length is made on the line as indicated above, commencing a little above Poupart's ligament, dividing the skin, superficial and deep fascia, and the overlying muscular structure, exposing the vessel, carefully avoiding the accompanying veins, and wounding the peritoneum. Pass the ligature from within outward, and dress the external wound in the usual manner and enjoin rest in bed until the incised wall is firmly united to prevent hernial protrusion at the point of the traumatism.

Ligation of the Facial Artery

The facial artery is one of the principal branches of the external carotid, and is distributed to the muscles of the face. It leaves the external carotid a little above the bifurcation of the common carotid, and passes obliquely forward and upward through the submaxillary gland, and over the ramus of the jaw, resting in the groove located on the outer side of the bone. The anterior inferior margin of the masseter muscle will serve as a guide to the artery as it passes the angle of the jaw, at which point it is usually ligated. It may also be ligated near its origin in the neck, and at the angle of the mouth.

In the operative procedure it is well to bear in mind that the facial vein that accompanies the artery, lies superficial to the vessel.

To approach the artery the incision will divide the skin, superficial and deep fascia, and the platysma myoides muscle. Retract the edges of the wound including the vein, exposing the artery. In this positon, pass the aneurysm needle armed with the ligature from behind forward. The incision in the overlying soft parts should be small, and drawn together with two or three strips of Z. O. plaster at the conclusion of the operation.

Ligation of the Femoral Artery.

The femoral artery is the continuation of the external iliac, and takes this name from its origin at Poupart's ligament to its termination at Hunter's canal at about the junction of the middle and lower thirds of the thigh. From a surgical standpoint this artery is of special significance, its ligation being frequently required in injuries of the vessel itself and to control hemorrhagic losses in morbid states of the parts below the vessel. The vessel can be ligated at any point in its course, but the part usually chosen on account of the ease by which the artery is approached, is at the apex of Scarpa's triangle; the next available location is the middle of the thigh, the third situation, being at Hunter's canal, is seldom selected for the operation, especially if the first

Fig. 61.—Ligation of the femoral artery and the external iliac immediately above Poupart's ligament.

and second positions are available. From the upper part of the artery, and just below Poupart's ligament there are given off

several branches that will have to be reckoned with when tying off the artery in the first position; these are the epigastric, superficial external pudic, the circumflex ilii, and the deep profunda. The femoral vein accompanies the artery throughout its entire course, which lies to the inner side at Scarpa's triangle but passes gradually behind the artery in the lower part of its course.

To ligate the vessel in its upper part an incision is made from a point just below and on a line corresponding with the center of Poupart's ligament downward to the extent of three or four inches dividing the skin, superficial fascia, and fascia lata, which with the lymphatic glands and cellular tissue is retracted to bring into view the edge of the sartorius muscle; this is pulled to the outer side exposing the sheath which is picked up with thumb forceps and opened to the extent of a half inch on the outer side. The pulsation of the vessel noted with the finger, will direct its immediate location. The aneurism needle armed with the ligature is passed from within outward, cautiously avoiding the femoral and saphenous veins, and the genito-urinary and the anterior crural nerve. After placing the ligature the ends should be cut short, the external wound cleansed and dressed antiseptically, and the patient kept at rest in bed for three weeks or longer if post-operative conditions demand it.

If it becomes necessary to ligate the artery in the second position, that is in the middle of the thigh, the incision is made over the artery on a line extending from the center of Poupart's ligament to the inner tuberosity of the femur; its center being a little above the junction of the lower and middle thirds of the thigh, and extending each way for about two inches. After dividing the skin, and subcutaneous tissue, the sartorius muscle is brought into view, and retracted to the outer side. The vessel is located by its pulsation, the sheath opened as directed in the first position, the ligature placed and tied, the work being done under strict antiseptic precautions.

To reach and ligate the artery in the third position, the incision should be made about one inch internal to the linear guide line mentioned in the operative procedure in the second position, at about the junction of the middle and lower thirds of the thigh. The skin and the subcutaneous tissue are divided, exposing the saphenous vein, which should be drawn aside bringing into view

the fascia lata, which is divided upon a grooved director. The sartorius muscle will now appear in the bottom of the wound which should be retracted, exposing the aponeurosis at the anterior border of Hunter's canal; this separated and the femoral vein retracted the ligature is placed around the artery from without inward and tied. The same operative technique is observed as advised in the first operation.

Ligation of the Gluteal Artery.

The gluteal artery is the largest branch of the internal iliac, and leaves the pelvis at the upper border of the great ischiatic notch, above the pyriformis muscle. A line drawn from the posterior superior spine of the ilium, to the trochanter major marks the course of the artery, the vessel resting beneath the upper half of the linear guide.

The artery does not lie so deep but that it is subject to traumatic injuries necessitating ligation to arrest hemorrhage. To reach the artery an incison is made to divide the skin, superficial fascia, loose areolar tissue, the gluteus maximus muscle and deep fascia. The divided tissues are retracted and the artery found near the upper part of the ischiatic notch. The pulsation of the artery will aid in tracing its course, and when freed from the accompanying vessels the ligature is passed from within outward. The operative work is done under strict antiseptic precaution, and the patient enjoined to rest quietly in bed for two or three weeks.

Ligation of the Common Iliac Arteries.

The common iliac arteries are branches of the aorta, about two inches in length, having their origin at about the middle of the fourth lumbar vertebræ, and extending downward and outward to the point of bifurcation of the external and internal iliac branches. A linear guide to the common iliac arteries will be from a point one inch above the umbilicus, downward and outward to a point a little external to the center of Poupart's ligament. There are two methods of operative procedure by which the common iliac artery is reached and ligated; the first is enter-

ing the abdomen through an incision about six inches in length made through the abdominal wall about three inches to the left or right of the median line, according to which of the trunks is to be tied off; the incision commencing above about on a line with the umbilicus and extending downward on a line of the rectus abdominis muscle. After entering the abdomen the contents are pulled aside, the iliac vessel located by its pulsation, the overlying peritoneum picked up and niched with the knife or scissors and then slit for two inches on a grooved director, the ligature passed from without inward on the right side, and from within outward on the left side. Great caution is taken not to injure the ureter or the blood vessels that lie in close proximity to the common iliac in placing the ligature. To aid in approaching the artery the intestines can be brought out of the abdominal cavity, keeping them wrapped in warm sterile towels, while the patient is placed in the Trendelenburg posture. The ligature placed and the ends cut short, the wound in the abdomen is closed in the usual manner.

The second method of reaching the artery is through an incision extending from near the end of the eleventh rib, downward and curved a little backward and then forward on a line to reach a point over the internal abdominal ring. To approach the artery the incision divides the skin, superficial fascia, down to the aponeurosis of the external oblique, this is divided upon a grooved director as are the fibers of the internal oblique and the transversalis muscles. After passing through the latter the finger is introduced and upon it the opening is extended upward to the extent of the incision in the overlying tissues; the peritoneum being held back by the finger to prevent injury. At this point in the procedure the peritoneum is separated from the psoas and iliacus muscles and displaced upward and inward with a flat retractor held by an assistant, while the surgeon locates the common iliac with his finger. It will be found difficult to bring the artery into view in most cases before passing the ligature, the placing of it being done with the aneurism needle upon the finger after the loose cellular tissue has been dissected back with the director or finger. The ligature is passed from within outward, carefully avoiding inclosing the ureter and the accompanying vessels in the loop of the strand. To successfully cope

with the intricacies of the operation the operator must have th
anatomy of the pelvic region well in hand.

In this operation as well as in others upon the large vascula
trunks the surgeon must always be mindful of the variation ir
quently found in the arterial and venous systems as regards tl
size, course, and divisions of the large vessels.

Ligation of the External Iliac Artery.

The external iliac artery is larger than the internal ilia
and extends from the bifurcation of the common iliac to Pou
part's ligament. It is about four inches in length, and is mo
frequently ligated than the internal and common iliac co
bined. It is usually ligated at about the middle of its lengt
The vessel lies near the inner border of the psoas muscle whi
forms a most reliable guide.

Fig. 62.—Ligation of the external iliac and the femoral
arteries.

To approach the artery a slightly curved incision about four inches in length is made about an inch above Poupart's ligament, beginning at about its center, passing outward and upward to a point on a line level with the anterior superior spine of the ilium, but about two inches internal to this point. The incision divides the abdominal wall down to the peritoneum, which is separated from the surface of the psoas and iliacus muscles and displaced with the enclosed intestines inward and upward, exposing the artery surrounded with loose cellular tissue which is dissected back with a grooved director and the ligature passed from within outward, being cautious not to enclose the accompanying nerves and iliac vein within the loop of the ligature.

To ligate the artery through the intraperitoneal route the surgeon can follow the directions advised in the operation on the common iliac artery, with the exception that the incision should be made along the lower part of the linea semilunaris instead of in the median line. The ligature placed, the external wound is dressed in the usual manner, and the patient kept at rest for three or four weeks in bed, and fed on a nourishing fluid diet.

Ligation of the Internal Iliac Artery.

The internal iliac artery is the smallest branch of the common iliac, and is about one and a half inches in length. It originates at the bifurcation of the common iliac artery and terminates at the upper margin of the great sacro-sciatic foramen. The inner border of the psoas magnus muscle will serve as a guide to the artery.

To ligate the vessel without entering the peritoneal cavity the same course and technique are followed as for ligature of the common iliac artery. The ligature is placed about one half inch from the bifurcation, from within outward, carefully avoiding the internal iliac vein that lies just behind the artery. To reach the artery through the abdominal cavity the operative technique will not differ materially from that followed in ligating the common iliac artery by the intraperitoneal route.

Ligature of the Innominate Artery.

The success attending the ligation of the innominate artery in the past hardly justifies the surgeon to attempt the oper-

ation. We have a history of two recoveries in thirty-one ligations of the vessel, with several attempts to ligate the artery left unfinished. Aneurism of the vessel is given as the only justifiable reason for tying the artery. The operation is a formidable one to contemplate on account of the depth at which the vessel rests, and the numerous important vessels and nerves that lie close to the artery that are subject to injury during the operative procedure.

The most favored location for executing the operative work is just above the clavicle, the incision being of V shape extending from a point near the sternal notch up along the anterior border of the sterno-mastoid muscle, and about the same distance along the upper border of the clavicle, dividing the skin, and superficial fascia including the small vessels that lie superficial. This triangular flap is turned back to its fullest extent. The sterno-thyroid and sterno-hyoid muscles, and a part of the sterno-cleido-mastoid are incised or separated and retracted, and the inferior thyroid veins are recognized and pulled aside, exposing the sheath in which the common carotid artery, the pneumogastric nerve, and the internal jugular vein are imbedded. The sheath is opened and the common carotid is brought into view, and traced down to the subclavian and the innominate arteries. The loose surrounding tissue, including the nerve and vessels, which are separated from the artery and retracted, exposing the artery which is tied by passing the ligature from below upward and inward, tying the vessel as high as possible that a clot of sufficient size may form. Care should be taken not to enter the pleural cavity.

Ligation of the Lingual Artery

The lingual artery is a branch of the external carotid, and is given off from the latter between the superior thyroid and facial. Operations on the tongue occasion the principal reason for its ligation. At and near its origin it passes upward and inward, approaching the great cornu of the hyoid bone, and in this location it is covered with skin, superficial fascia, the platsyma myoides muscle, and veins.

The artery is reached through an incision made from the point of the chin obliquely downward and backward, passing

ıe hyoid bone near its cornu, thence upward and backward in
ıe direction of the mastoid process to about the angle of the
ıwer jaw. After cutting down through the overlying tissues,
ıd approaching the deep fascia, the flap composed of the skin,
ıperficial fascia and platysma, is reflected upward as far as the
ɔrder of the lower jaw. The next step will be the opening of
ıe deep fascia for an inch or more, bringing into view the sub-
ıaxillary gland, which should be turned upward, exposing the
ːndon of the digastric and the hypoglossal nerves. In some cases
 may be better to remove the gland in its entirety; this is done
ʏ blunt dissection or enucleation with the finger. It is not of
›ecial need to throw a ligature around the duct before
ːvering it from the gland. Should the facial artery
ᴣ severed while removing the gland it should be picked
ɔ and tied at once between its origin and the gland if possible.
 other blood vessels be cut, especially the facial vein, they had
ːtter be clamped and tied to prevent the escaping blood from
›scuring the operative work. Beneath the subʍaxillary gland
 the lingual triangle, the floor of which is formed by the hyo-
ossus muscle, and by dividing its fibers with scissors after
ising it up with thumb forceps, the lingual artery is exposed.
he ligature is then placed with the aneurysm needle from above
ıwnward, using care not to include the vein that usually ac-
ʍpanies the artery. In amputation of the tongue, both lin-
ıals will require ligation; the removal of a tumor, cancerous
 other forms, may only require the ligation of the lingual on
e affected side.

Ligation of the Internal Mammary Artery

The removal of tumors, and operations upon the ribs often
quires the ligation of the internal mammary artery. A linear
ıide to the vessel is a line about one-half inch to the outer side
 the sternum, and parallel with that bone. To reach the
tery an incision is made through the skin, superficial fascia,
ıd the inner portion of the pectoralis major muscle down to the
ɔs; and as the vessel passes the third intercostal space, the in-
rcosta1 muscles are opened up and the artery with its accom-
ınying veins will be found surrounded by loose connective
ssue. Some surgeons prefer resecting the cartilage of the first

or second rib, or the cutting away of a portion of the opposing edges of each rib in efforts to reach and ligate the artery. In executing the operative work the artery is carefully isolated from the vein, or veins, before passing the ligature; care being exercised also not to wound the pleura which rests adjacent to the intercostal muscles.

Ligation of the Occipital Artery

The occasion for the ligation of the occipital artery is usually stab wounds or accidental lacerations of the scalp. It is a

Fig. 63.—Ligation of the anterior temporal, temporal, occipital and facial arteries.

branch of the external carotid artery and is distributed to the muscles of the occiput and neck. If conditions permit, the vessel is either tied off near its origin or back and a little below the mastoid process. To reach the artery in this location the incision, about one and a half inches in length is made to divide the skin, superficial fascia, the insertion of the sterno-mastoid muscle, and the aponeurosis of the splenius muscle; then by retracting the cut edges of the external wound the artery may be located by the finger by its pulsation. The digastric muscle

may have to be pulled aside in order to expose the vessel. The ligature is passed from within outward.

To reach the artery near its origin, an incision is made through the overlying tissues along the anterior border of the sterno-mastoid, by blunt dissection of the veins, and nerves are pulled aside until the posterior belly of the digastric muscle is reached, behind which the artery rests accompanied by the glosso-pharyngeal nerve for a short distance. The ligature is placed around the artery from above downward; avoid including the nerve in the ligature.

Ligation of the Peroneal Artery.

The peroneal artery branches from the posterior tibial artery about one inch below the lower border of the popliteus muscle, passes obliquely outward to the fibula and then downward along the inner border of that bone to about the junction of the lower and middle thirds of the leg. A line drawn from a point at the posterior border of the head of the fibula to the external border of the tendo Achillis at its insertion, will mark the course, the vessel takes in the back part of the leg.

It is usually tied in the lower half of its course at which point it is covered by skin, superficial and deep fascia, and the overlapping edges of the tibialis posticus, and flexor longus pollicis muscles. The incision will divide the skin and fascia, the edges of the muscles are retracted, the sheath in which the artery is imbedded is separated with the director and the artery exposed. Place the ligature from within outward, avoiding the veins that accompany the vessel. In traumatic injuries it may be possible to pick up the severed ends and tie them in the open wound. After ligaturing the vessel the external wound is closed with catgut sutures and a pad of sterile gauze placed over the incision, and all bound in with a sterile roller bandage.

Ligation of the Popliteal Artery.

The popliteal artery is a continuation of the femoral, and commences at the adductor magnus muscle, passing obliquely downward and outward behind the knee-joint, and terminating at the lower border of the popliteus muscle. The ligation of

this vessel is not often required. Rupture and traumatic injuries
may demand the tying of the artery. The vessel lies deep be-
tween the condyles of the femur with the popliteal vein and nerve
in close proximity and on the outer side imbedded in fat and
fibrous tissue. In cutting down upon the artery care is to be
taken not to injure any of the many branches that spring from
the popliteal, especially in the upper and lower thirds of the ves-
sel. The incision should be made about four inches in length
along a vertical line through the popliteal space, dividing the
skin, and subcutaneous tissue and the aponeurosis covering the
deeper structures. The leg should be flexed to aid in fully re-
tracting the severed tissues. The fat and loose areolar tissue is
divided with a groove director, exposing the artery around which
the ligature is placed from without inward, avoiding the closely
associated vessels and nerve. The external wound is dressed
in the usual manner, the patient kept at rest in bed with the leg
slightly flexed and placed on a pillow or soft cushion.

Ligation of the Internal Pudic Artery.

The internal pudic artery is a branch of the anterior trunk
of the internal iliac artery, and is distributed to the external or-
gans of generation. Its ligation is sometimes required to con-
trol hemorrhage from the penis in traumatic injuries of that or-
gan. A guide to its location in the perineum is a line extending
from the highest part of the pubic arch to the inner border of the
tuber ischii; the artery is found resting a little above the lower
margin of the tuber ischii. To reach the artery an incision is
made over the artery along the line indicated about four inches
in length, which divides the skin, superficial fascia, and muscular
tissue down to the vessel which is freed from surrounding loose
tissue with the grooved director and the ligature passed and tied.
The external wound is closed with three or four catgut stitches
and dressed antiseptically.

Ligation of the Radial Artery.

The radial artery is the smaller of the two branches of the
brachial artery. It courses down the inner side of the fore-arm
and is distributed to the fore-arm, wrist and hand. It lies very

superficial, being covered in most part by the skin, superficial fascia, and aponeurosis. Owing to the great exposure of the forearm to external violence the artery is frequently injured. The linear guide to the artery extends from a point midway between the condyles of the humerus to the inner side of the extremity of the styloid process of the radius. The muscular guide to the vessel is the inner border of the supinator longus muscle, which overlaps the artery along portions of the course of the vessel.

To reach the artery an incision one and a half to two inches long is made along the linear guide line, dividing the skin, super-

Fig. 64.—Ligation of the ulnar and radial arteries.

ficial fascia, and fat, exposing the deep fascia, after incising which, the edge of the supinator longus is exposed just beneath which the artery rests. In placing the ligature the surgeon should be cautious not to include the radial nerve and venæ comites, which lie close to the vessel throughout most of its course.

To ligate the artery just above the wrist, where it rests between the tendons of the supinator longus externally and the flexor carpi radialis internally, the overlying tissues must be divided and retracted, exposing the vessel. In passing the liga-

ture the accompanying veins must be avoided. The radial nerve
does not extend down the arm to this point.

Ligation of the Sciatic Artery.

The sciatic artery is the larger of the two terminal branches
of the anterior trunk of the internal iliac artery, and is distribut-
ed to the muscles of the back of the pelvis. A line extending
from the posterior superior spine of the ilium to the tuberosity
of the ischium will indicate the course of the vessel. The in-
cision will divide the skin, superficial fascia, areolar tissue and
the gluteus maximus muscle, also the deep fascia, exposing the
pyriformis muscle, beneath the lower border of which the artery
rests. In passing the ligature, which is done from within out-
ward, care is to be exercised not to include the accompanying
nerve and vessels. Dress the external wound antiseptically and
keep the patient at rest in bed for two or three weeks.

Ligation of the Subclavian Artery

It is well to bear in mind that the right subclavian branches
from the innominate artery, and the left from the arch of the
aorta, in operations upon these vessels. A linear guide to the
subclavian is a line about a half inch above and parallel to the
clavicle, and extending from the outer edge of the sterno-mas-
toid muscle to the inner edge of the trapezius muscle. To ap-
proach the artery readily, the shoulders of the patient should
be raised, and the head thrown back and turned to the opposite
side from the field of operation. The incision made along the
line of the vessel will pass through the skin, superficial fascia,
fat, and deep fascia. In passing through the latter, great care
should be taken not to cut the external jugular vein or the venus
plexus; should this accident occur the vessel is to be clamped
and tied at once. To avoid injuring these vessels, the tissue that
invests them should be separated with a grooved director or the
handle of the scalpel. After the deep fascia has been penetrated
the artery will be found imbedded in loose and fatty tissue.

The portion of the vessel that is usually sought for ligation
lies upon or close to the first rib, and to reach it the surgeon

should locate and follow downward the tendon of the scalenus anticus to the rib. The tubercle upon the first rib will serve as a guide in locating the artery, which is ligated by passing the ligature from below upward and inward, avoiding the adjacent vessels and nerves within the loop. While efforts are being made to locate the artery after the overlying tissues have been severed, blunt retractors are used to separate the edges of the wound, and all deep tissues are separated with the fingers or the groove director, care being taken not to wound the pleura, which lies behind and a little above the clavicle. To lessen the oozing or passive hemorrhage during the operative work, the severed tissue should be mopped with sterile adrenalin chloride. It will be well after passing the ligature to be sure that it surrounds the artery and not a nerve trunk, or other structure, the pulsation of the artery being the only reliable guide. Silk is preferred to catgut in the ligation of arteries lying in locations difficult to approach.

Ligation of the Temporal Artery

The temporal artery is one of the branches of the external carotid, and leaves this trunk within.the structure of the parotid gland, and passes upward across the root of the zygomatic arch. The location of the vessel is quite easily determined by the pulsation readily felt with the finger; this and the process on the zygoma are the only guides to the artery.

The incision made along the line of the artery should be about an inch and a half in length, and will divide the skin, and superficial fascia. Retract the edges of the wound, and expose the vessel. In passing the ligatures, carefully avoid the vein and nerves lying adjacent to the artery.

Ligation of the Palmar Arches.

The ligation of the palmar arches is occasionally required in accidental stab and other incised wounds of these vessels or some one of the numerous branches springing from these trunks. A reliable guide to the superficial arch is a slightly curved line extending from the palmar border of the extended thumb, across the palm to the distal border of the pisiform bone. To reach the artery an incision an inch or more in length is made through

the skin, superficial fascia, cellular tissue, palmar brevis muscle, and the deep palmar fascia. The incision should be made on a line parallel with the course of the nerves and tendons overlying the arches. On exposing the artery both ends of the bleeding vessel should be ligated on account of the anastomosis existing between the vessels at this point. The ligature is placed from above downward, carefully avoiding the median and ulnar nerves.

The deep palmar arch lies a little nearer the wrist than does the superficial arch. The linear guide to the vessel should extend across the palm about three-quarters of an inch nearer the wrist than was mapped out to reach the superficial arch; in other respects the same technique is observed as advised in ligation of the superficial arch. The deep arch resting deeper in the palm of the hand will necessitate the retraction of the margins of the incised tissues to readily expose the vessel.

Ligation of the Inferior Thyroid Artery

The inferior thyroid artery is a branch of the thyroid axis which is a short thick trunk arising from the fore part of the inner portion of the subclavian artery. It is distributed to the larynx, esophagus, neck, and thyroid gland. Operations upon the thyroid body necessitate ligation of this vessel. The linear guide to this artery is along the anterior border of the sterno-mastoid muscle. It lies in front of the vertebral artery, and the longus colli muscle. The recurrent laryngeal nerve, the thoracic duct, and the middle cervicle ganglion lie in close proximity to the artery, and should be cautiously avoided when ligating this vessel. To reach the artery the incision will need to pass through the skin, superficial and deep fascia, and the platysma muscle. The artery will be found beneath the sterno-mastoid muscle, and carotid artery with its surrounding sheath, which will need be drawn to the outer side to expose the inferior thyroid. The needle armed with the ligature is passed from within outward.

Ligation of the Superior Thyroid Artery

,The superior thyroid artery is a branch of the external carotid, and is distributed to the omo-hyoid, sterno-hyoid, sterno-thyroid muscles, and the thyroid gland. To reach the artery, an incision

nade from the hyoid bone, extending obliquely downward
outward to about the anterior border of the sterno-mastoid
scle. The tissues incised to reach the artery are the skin,
erficial fascia, the platysma, and the deep fascia. Separate
incised margins of the wound with blunt retractors and ex-
e the artery between the larynx and its origin. In passing
ligature cautiously avoid including the superior laryngeal
ve in the loop.

Ligation of the Anterior Tibial Artery.

The anterior tibial artery branches from the popliteal near
bifurcation of that vessel, and at the lower border of the pop-
is muscle, from whence it passes forward and downward be-
en the bones of the leg to the anterior part of the limb and
ice downward to near the ankle joint where it terminates in
dorsalis pedis artery.
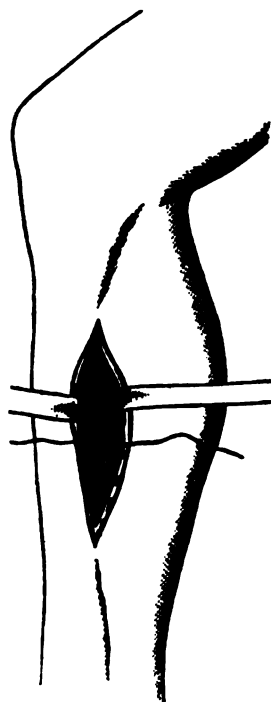
Fig. 65.—Ligation of the anterior tibial artery in the middle
third.

Owing to the great exposures to which the artery is subjected, it is frequently injured, especially in severe fractures of the bones of the leg. A linear guide to the course of the artery down the anterior surface of the leg commences at the inner border of the head of the fibula and terminates in front of the ankle midway between the malleoli. It is accompanied by the anterior tibial nerve and venæ comites throughout its entire course. The vessel can be tied at any point on the anterior surface of the leg. In the upper third an incision is made along the linear guide about four inches in length, dividing the skin and subcutaneous tissue, and deep fascia. After exposing the tibialis anticus and extensor longus digitorium muscles, they are retracted and the artery is looked for in the loose cellular tissue composing the interspace. After stripping it of its surrounding tissue the ligature is passed from without inward avoiding the nerve and veins in the procedure. In this part of its course the vessel lies very deep and is seldom ligated here except in cases where the middle third is involved in the traumatism. The ligature being placed and the ends cut short the external wound is dressed antiseptically and the limb placed at rest upon a pillow or cushion.

To tie the vessel in the middle or lower third the operative technique does not differ materially from the successive steps just described in the ligation of the artery in the upper third. except that the artery is more easily approached in the lower part of its course. The pulsation of the artery will always guide the operator to its immediate location, unless the vessel should be absent or exceedingly small.

Ligature of the Posterior Tibial Artery.

The posterior tibial artery is a large branch of the popliteal, and extends obliquely downward from the lower border of the popliteus muscle posterior to the tibia, and terminates at a point between the ankle and the heel where it separates into the internal and external plantar arteries. The vessel is frequently severed in traumatic injuries requiring ligation in the lower, middle, or upper third of its course. It rests upon the tibialis posticus throughout the most of its course, and in its lower third

is very superficial, being covered merely by skin and fascia. It is accompanied by the posterior tibial nerve and venæ comites. In the upper and middle thirds the artery is covered by the soleus muscle, the deep fascia intervening. A linear guide to the course of the vessel is a line commencing in the middle of the popliteal space to a point about one inch back of the internal malleolus. To reach the artery in the upper third an incision five or six inches in length is made along the linear guide to the vessel commencing at the lower angle of the popliteal space, passing downward dividing the skin, and superficial fascia; locate and retract the superficial veins, divide the soleus muscle and the deep fascia, locate the artery and pass the ligature from without inward avoiding the nerve and veins. Before commencing the incision the leg is flexed upon the thigh, and the thigh upon the pelvis and rotated outward; in this position the muscles are relaxed and can be well retracted while making efforts to locate the artery. After tying the vessel the external wound is closed with catgut sutures and dressed antiseptically, and kept at rest for ten days to two weeks.

To tie the artery in the middle third, an incision is made three inches or more in length over the artery along the linear guide line, dividing the skin and subcutaneous tissue and deep fascia down to the soleus muscle, the edge of which is retracted exposing the artery with its accompanying nerve and veins surrounded with loose areolar tissue, which is separated from the artery with a groove director; the ligature is then passed from without inward, being cautious not to include the vessels and posterior tibial nerve in tying the loop.

To ligate the artery in the lower third or behind the ankle, an incision is made about one inch posterior to the inner edge of the tibia, three inches in length parallel with the tibia above the ankle, or in a curved line if the vessel is to be reached behind the ankle. The skin and fascia are divided, exposing the mass of areolar tissue, in which the vessels and nerve are imbedded; this is separated with a groove director, the artery brought into view and tied; the ligature passed from without inward. Cut the ends of the ligature short and close the external wound in the usual manner.

Ligation of the Ulnar Artery.

The ulnar artery, the largest branch of the brachial artery, commences a little below the bend of the elbow, passes obliquely to the ulnar side of the fore-arm and thence on a straight line to the radial side of the pisiform bone. It is distributed to the fore-arm, wrist, and hand. The inner border of the flexor carpi ulnaris muscle serves as the muscular guide to the artery. It rests deeper in the tissues of the fore-arm than does the radial artery. The vessel can be ligated at the junction of the upper and middle thirds, at any point of the middle third, and at the wrist. It is seldom ligated at the former situation.

To reach the middle third, an incision should be made an inch and a half long over the artery, dividing the skin, superficial fascia, and deep fascia. The interspace between the flexor carpi ulnaris and the flexor sublimis digitorum muscles is separated by blunt dissection with a grooved director. After exposing the artery the ligature is passed from within outward carefully avoiding the ulnar nerve that lies on the inner side of the vessel, and the veins that accompany the artery.

In the lower third the artery is quite superficial. It rests between the tendons of the flexor carpi ulnaris muscle on its inner side, and the flexor sublimis on its outer side. To reach the vessel an incision an inch or more in length is made over the artery, dividing the skin and superficial fascia. After exposing the deep fascia a portion of it is pinched up with mouse-tooth forceps, incised with the point of the scalpel to the extent of a quarter of an inch, the edges slightly retracted, and the ligature placed with the aneurism needle from within outward, carefully avoiding the ulnar nerve that passes close to the inner side of the vessel in this part of its course. The pulsation of the artery will serve as a guide to its immediate location during the dissection.

Ligation of the Vertebral Artery

The ligation of the vertebral artery is seldom required, however gunshot and stab wounds may call for the operation. The vessel arises from the first part of the subclavian and passes through the deep part of the neck. A reliable guide to the artery is the transverse process of the sixth cervical vertebra; some

surgeons use the tubercle on the transverse process of this verte-
bra as the guide. To reach the artery it will be necessary to
divide the skin, the superficial fascia, platysma, and the deeper
fascia. The line of incision should be along the posterior border
of the sternomastoid muscle. After retracting the margins of
the wound, the sternomastoid muscle should be drawn forward,
when the artery will be exposed after snipping the deep fascia
which surrounds it. The vertebral vein accompanies the artery,
and care should be taken not to include it in the loop of the
ligature when passing it around the artery. The ligature is
placed around the artery from without inward.

Ligation of the Intercostal Arteries

The intercostal arteries spring from two important vascular
trunks, the subclavian and the aorta. Each vessel accompanied
by the intercostal vein and nerve is located just beneath the
lower border of the rib. Accidental injuries demand
their occasional ligation, which is done near the seat of
injury, by dividing the overlying structures, retracting the edges
of the wound, separating the artery from the vein and nerve by
careful dissection, and then passing the aneurysm needle armed
with the ligature from above downward. It may be necessary
in some cases to resect a part of the rib to enable the surgeon
to reach the artery; and it will be necessary to ligate both ends
of the severed vessels on account of the anastomotic nature of
these arteries.

ARTERITIS

Inflammation of an artery may be both acute and chronic.
The acute form usually affects a very limited portion of the
arterial vessel and is provoked by the extension of the inflam-
mation from the adjacent tissues, and the lodgment in some
part of the vessel of an infectious embolus. The chronic form
is due to some ailment that seriously changes the structures
of the body, not alone the arteries, but the functional organs
as well, chief among such ailments may be mentioned syphilis,
alcoholism, nephritis and traumatic injuries.

In the acute form the coats of the artery often become

softened in circumscribed spots, causing a swelling or bulging of that portion of the vessel simulating aneurysm. There are usually tenderness and pain along the course of the vessel, with a change of character in its pulsation.

In chronic states the distal vessels, like the temporal, radial and other superficial arteries, feel hard under pressure, but are not as sensitive to the touch and are less painful than in the acute form. Not infrequently serious attacks of the disease terminate in aneurysm, apoplexy, and in some instances, gangrene, as a result of occlusion of the vessel.

Treatment: The aim in treatment is mainly preventive, if the nature of the morbid condition is determined early; later after marked changes in structure of the coats of the vessel have taken place, the patient should be enjoined to avoid strenuous exercise, excitement, excesses of every nature, especially in partaking of alcoholic beverages. During periods of difficult breathing, the patient should be placed in a semi-recumbent position and kept at rest. Glonine in moderate doses, given hypodermically at this time, or when the arterial tension is high, will usually bring prompt relief.

Remedial agents administered internally, or applied externally have little effect in relieving the morbid changes that have taken place in the tunics of the arteries. Iodide of potassium in moderate doses given three or four times a day in the early phases of the diseased state, has favorably impressed some cases; the drug has no place in long standing cases.

The diet should be composed of milk, rice, custards, fruits of all kinds, vegetables, to which bits of fish, scraped beef, or dried beef with a milk gravy may be added.

Alcohol and strong condiments should be avoided, heavy meals of meat and richly made dishes should be eschewed.

PHLEBITIS

Veins being organized structures they are subject to inflammation as are the arteries and lymphatic vessels. The inflammatory action is due to several causes, chief of which, are gout, traumatism, occlusion of the vessels and abscess formations.

In cases due to injuries the inner coat becomes roughened serving as centers for the lodgment of a thrombus, which may later become the point of infection from the invasion of suppurative germs causing one phase of the disease known as suppurative phlebitis.

The symptoms accompanying this form of phlebitis are rigors, hectic fever, thirst, headache, tenderness and pain along the course of the vessel, with infiltrations around or near the vein which later soften the tissues causing metastatic abscesses. When the external veins are the seat of disease they can be felt beneath the skin as a hard knotted cord-like substance, and can be traced by the red line that usually marks the course of the vessel.

The diagnosis is somewhat more obscure when the deeper veins are affected; here also there is tenderness on pressure along the course of the vessel and more or less pain when the limb is allowed to hang down, which is relieved when the limb is raised. The distal part of the limb, that is the hands, feet, and ankles, are apt to be swollen and often œdematous in cases with partial or total obstruction of the vessel.

When due to gout, rheumatism, or other diseases of a systemic nature the superficial veins are more frequently affected than are the deeper vessels and recurrence of the morbid state is frequently noted.

Inflammation of the lymphatics gives rise to symptoms similar in nature to those observed in phlebitis, except that lymphangitis develops more rapidly, runs a more acute course, is likely to effect the superficial lymphatic vessels which is followed by diffuse redness, with more or less œdema of the parts.

Treatment: The treatment consists in removing the cause of the inflammatory state in so far as this can be done. Gouty and rheumatic conditions must be met with the indicated remedies; bryonia, macrotys, jaborandi, colchicum and the salicylates are medicinal agents to be thought of here. They are not all to be given at one time, but two or more can be administered for a few days then changed for some of the other indicated remedies. Anemic conditions are to be overcome with phosphorus, iron, arsenic, Nux and the bitter tonics given in potent doses according to the existing indications for the remedies.

The action of the kidneys should be kept free, and constipation overcome with laxative remedies.

The patient should be enjoined to keep at rest in bed and the part affected kept at a slight elevation. To prevent swelling of the part and give support to the tender and inflamed vessels a light flannel bandage should be run on the limb, caution being taken not to bandage so tight as to interfere with the circulation.

As a topical application to relieve pain, inflammation, and to promote absorption the following formula serves a good purpose:

R.
Spc. Med. Veratrum Vir. .... ℥j
Tr. Arnica .... ℥iij
Glycerine ...., ℥j

M. Sig.—Use locally along the course of the inflamed vessels.

After the acute symptoms have subsided the limb may be massaged to stimulate a better circulation through the part.

Light nourishing food should compose the diet, avoiding stimulants of every variety.

The treatment of suppurative phlebitis will not differ essentially from that advised in that form of the disease just described. As the formation of abscesses is prone to deplete the system by crippling the appetite and digestion, active peptics and tonics are plainly indicated. Fowler's solution in syrup of lacto-phospate of lime is first to be thought of to overcome the systemic depletion. Phosphoric acid dilute taken in a little sweetened water will whet the appetite and correct morbid states of the system in which there is a tendency to a deposit in the tissues of cacoplastic material. Abscesses that form along the course of the vessels are to be incised, the pus evacuated, and the cavities irrigated with bichloride or permanganate solutions.

The patient is to be kept at rest and a generous nourishing diet advised composed of eggs, beef, milk, custards, fowl, pickled pig's feet, chipped beef, rich soups, salads, sweet pickled peaches, graham bread and butter, rich cream and vegetables.

LIGATION OF VARICOSE VEINS

A vein is said to be varicose when it is abnormally dilated, and when this condition exists the coats of the vein have under-

Fig. 65a.—Varicose veins and ulcers of the leg. (*Howe.*)

Fig. 65b.—Varicose Ulcer. (*Howe.*)

Fig. 65c.—Making a reverse in the application of a spiral bandage.

Fig. 65d.—Elastic stocking for the treatment of varicose veins. (*Howe.*)

The action of the kidneys should be kept free, and constipation overcome with laxative remedies.

The patient should be enjoined to keep at rest in bed and the part affected kept at a slight elevation. To prevent swelling of the part and give support to the tender and inflamed vessels a light flannel bandage should be run on the limb, caution being taken not to bandage so tight as to interfere with the circulation.

As a topical application to relieve pain, inflammation, and to promote absorption the following formula serves a good purpose:

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    Spc. Med. Veratrum Vir. .... ʒj
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    Glycerine .... ʒj
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After the acute symptoms have subsided the limb may be massaged to stimulate a better circulation through the part.

Light nourishing food should compose the diet, avoiding stimulants of every variety.

The treatment of suppurative phlebitis will not differ essentially from that advised in that form of the disease just described. As the formation of abscesses is prone to deplete the system by crippling the appetite and digestion, active peptics and tonics are plainly indicated. Fowler's solution in syrup of lacto-phospate of lime is first to be thought of to overcome the systemic depletion. Phosphoric acid dilute taken in a little sweetened water will whet the appetite and correct morbid states of the system in which there is a tendency to a deposit in the tissues of cacoplastic material. Abscesses that form along the course of the vessels are to be incised, the pus evacuated, and the cavities irrigated with bichloride or permanganate solutions.

The patient is to be kept at rest and a generous nourishing diet advised composed of eggs, beef, milk, custards, fowl, pickled pig's feet, chipped beef, rich soups, salads, sweet pickled peaches, graham bread and butter, rich cream and vegetables.

LIGATION OF VARICOSE VEINS

A vein is said to be varicose when it is abnormally dilated, and when this condition exists the coats of the vein have under-

Fig. 65a.—Varicose veins and ulcers of the leg. (*Howe.*)

Fig. 65b.—Varicose Ulcer. (*Howe.*)

Fig. 65c.—Making a reverse in the application of a spiral bandage.

Fig. 65d.—Elastic stocking for the treatment of varicose veins. (*Howe.*)

gone certain degenerative changes that thin the walls of the vessel which dilate as a result of blood pressure rendering inactive the valves that are supposed to equalize the blood supply. The tortuous state of the superficial veins frequently noted in the lower extremities, compensates in a measure for the loss of valvular action. Not infrequently the wall of the vein or veins gives away spilling the blood into the surrounding tissue which sooner or later sets up a local inflammatory condition followed by discoloration of the skin, œdema, tenderness, and in many cases ulceration.

Treatment: The successful treatment of varicose conditions of the superficial veins will be, to a great extent, by surgical measures. At the outset of the morbid state, the local distress may be held in abeyance by the proper application of a flannel bandage to prevent distention of the vessels; an elastic stocking may do as well in most cases. Rest in bed with the part elevated will aid in the relief. These measures are merely temporary and need continuance to be of lasting benefit to the patient.

Ligation of the vein below the varices relieves the vessel of the blood pressure from its distal part, which, in many cases will prove sufficient to effect a cure; in others of a large aggravated form, it will be necessary to tie the vessel above and below the dilated mass which can be dissected out after turning back a flap composed of the skin and superficial fascia. Previous to tying the vein an elastic cord can be applied around the thigh six or eight inches above the knee and drawn sufficiently tight to obstruct the venous circulation, bringing the veins prominently into view which will aid materially in cutting down upon the vessel and passing the ligature, which should be of fine catgut; following this the external wound is closed by two or more catgut sutures, and dressed antiseptically.

If the varicosity be complicated by ulceration, all of the veins radiating from the open sore must be cut down upon and ligated, the ulcer curetted if its surface presents an excess of spongy and necrotic tissue, and subsequently dressed with antiseptic powder, solutions, or skin grafts as the case most needs.

Unless the patient be nervous and excitable, the operative work can be done under the influence of a local anæsthetic, a few

drops of a two to four per cent sterile solution of cocaine instilled in the overlying tissue two to five minutes before commencing the operation. These injections can be repeated as the work progresses.

LIGATION OF THE VEINS

The veins are frequently ligated to control hemorrhage and to cut off the circulation from vascular growths, including varicose states of these vessels in the different parts of the system where this morbid condition is found. In the event that the vein is severed in traumatic injuries the ends of the divided vessel may be picked up and tied in the open wound, or it can be tied in the continuity of the part. If a large trunk be opened in operative procedures it is either clamped at once or the severed ends are tied to prevent the flowing blood from obscuring the field of operation. Success has followed attempts at sewing or stitching a small niche in the wall of a large venous trunk, using fine silk in preference to catgut on account of the former being more firmly tied, and lasting longer.

The same danger attends ligation of the large venous trunks that often results so seriously in tying the arterial trunks, viz: secondary hemorrhage, pyæmia, and gangrene. The same operative technique and antiseptic precautions are observed in operations on the veins as on the arteries, except that in most cases the vein will require ligation above and below the seat of injury or field of operation in case of vascular growth or varicosities.

Bryant quoting Braun records three fatal cases in twelve ligations of the internal jugular, from secondary hemorrhage. In the lateral ligature of the femoral vein in eight cases, six died, five of pyæmia. Fourteen cases of gangrene of the leg followed the simultaneous ligature of the femoral vessels in twenty-four operations. In twenty-five cases in which the femoral vein alone was ligated gangrene did not occur. The ligation of veins, as a rule, is accomplished with greater ease than the operation on the artery, on account of the veins coursing nearer the surface in most instances, requiring operative measures.

NEVUS

An abnormal state of the capillaries of the skin and superficial blood vessels near the surface characterized by their tortuosity and dilatation is called a nevus.

If the morbid state appears at birth it is denominated a "mother's mark," and erectal tumor, when a small cellular area

Fig. 66.—Spreading capillary nevus. (*Farnum.*)

is divided into communicating spaces lined with endothelium which communicates with adjacent veins and arteries. The latter form of the morbid state often develops rapidly causing more or less disfigurement especially when located in the tissues of the neck and face.

When the artificial branches that supply the affected area

are small not infrequently a spontaneous cure has resulted. Hemorrhage often follows a degeneration of the mass whether cystic or suppurative in character.

In appearance the capillary nevus is red or port-wine colored. It may be smooth or elevated to a greater or less extent above the skin surface, sometimes rough and wart-like, and not infrequently covered with fine hair.

The erectal or arterial nevus usually appears on the face, neck, or upper part of the chest. It is elevated above the surface

Fig. 67.—Pigmented splotches (nevus) around the eye. Fig. 68.—The nevus removed by plastic operation. (*Howe.*)

of the skin, oval or irregular in outline with a pronounced pulsation which can be both seen and felt, indicating that bloodvessels of a considerable size enter into the formation of the tumefied mass.

Outside of the disfigurement and inconvenience of the pronounced cases of nevus there are few diagnostic symptoms, unless the mass is attacked with suppurative degeneration when slight rigors followed by fever, restlessness and pain may supervene.

The spontaneous cures that followed inflammatory action in

the morbid mass in some instances led to injecting nevi with irritating and caustic fluids. A few drops of pure carbolic acid or liquid perchloride of iron injected into the depths of the vascular mass will generally inflame the cellular tissue and constringe the blood vessels unless of large size. The author made an unsuc-

Fig. 69.—Large pigmented nevus. (*Farnum.*)

cessful effort to remove a vascular nevus the size of an egg from the cheek of a girl five years old in which the circulation was very active. A half drachm of liquid perchloride of iron was injected on three different occasions without any noticeable inflammatory

effect following, it was then ligated in quarters with a braided silk ligature and removed.

There is a moiety of danger in injecting a cavernous mass with coagulating fluids that are likely to form a clot which may become detached and later find lodgment in the heart, or some one of the large blood vessels, terminating fatally. Carbolic acid is a safer agent used in proper quantities; five drops deposited in two or three sections of the tumefied mass deep enough to reach the dilated vessels will usually set up a sufficient inflammatory action to bring about a cure.

Ligating the mass subcutaneously by the purse-string method is a safe and effectual way of cutting off the blood supply in erectal or arterial nevi. It can be done under local or general anæsthesia. Excision is frequently executed in aggravated cases if the location of the vascular tumor is favorable for the work.

Galvanopuncture and puncturing the affected area with a large needle heated to a red heat is recommended in "Mother's Mark." These punctures should be close together and extend through the thickness of the skin and fascia only.

Little good is accomplished by way of constringing the capillary nevus through the medium of caustic remedies topically applied, unless, it be minute in size and very superficial; to such, chemically pure nitric acid, Spc. Tr. thuja or a three per cent solution of ethylate of sodium may be applied with some degree of success. The thuja should be applied four or five times a days, the acid once every third day, and the sodium once a day for three or four successive days, using a glass rod in applying it. In case the discolored patch fails to yield to the above medicinal agents, and it does not cover too large an area, a cure may be brought about by plastic surgery; removing the morbid colored integument by several elliptical sections dissected away at different times till the unsightly patch has been removed is a favored method with many operators. If this operative procedure is properly executed there will be left only faint linear scar lines that will indicate the nature of the work performed.

Superficial capillary nevi or "Mother's Mark," covering

large areas of the skin surface, however unsightly, should not be attacked by either caustics or operative measures. .

VARICOCELE

Varicocele is a dilatation of the veins of the spermatic cord and scrotum.

The cause of the morbid state is somewhat obscure, although the abnormal condition is attributed to traumatism, constipation, laxity of the parts; congestion, from over sexual excitement, to occupations requiring the person to stand for long periods of time, to anatomical imperfections of the veins or their valves, especially situated on the left side, and to the veins on the left side being larger and longer than on the right. But whatever the provoking cause may be, the existence of the varicosity produces a sense of weight and fullness in the scrotum that is usually accompanied by pain and a dragging sensation, especially after severe physical exercise or prolonged standing.

With a tendency to varicocele the morbid state is early brought on in boys and young men through the habit of masturbation. They first complain of tenderness and aching in the testicle which is intensified by handling the parts and vigorous exercise. The scrotum and testicles have a doughy feeling and the dilated veins can be clearly outlined by pressing the scrotum between the fingers. Relief from the dragging sensation is often experienced when assuming the recumbent position.

As the swelling is confined to the scrotum, varicocele must be differentiated from hernia and hydrocele both of which conditions often affect the scrotum. Unlike hernia the mass cannot be returned within the abdomen by manipulation while the patient is lying down, neither does it show the translucency of a hydrocele when a light is placed on the opposite side of the tumor when examined in a dark room.

Treatment. Treatment in the early stages of the morbid state consists in supporting the sensitive parts in a good suspensory bandage and removing the exciting cause when this can be ascertained. When of long standing, operative measures offer the only promise of a cure. This consists of subcutaneous ligation, and excision of a part of the distended vessels. The former

is executed with a long straight needle with the eye near the point. With this instrument a ligature of silk is passed through between the veins and cord, and re-entered at the point of emergence, and made to pass around the opposite side of the veins and brought out and tied tightly at the point where the needle first entered the scrotum. In passing the ligature care should be taken not to include the vas deferens with the spermatic artery within the loop.

If the operation is done under proper antiseptic precautions the wounds will heal without suppuration. The work will be materially aided if small punctures are made in the scrotal wall with a sharp pointed bistoury. There is great danger of including or transfixing important vessels in doing this operation hence the work is fraught with some danger; on this account it has given way to the safer method of open incision with excision.

In the open operation, after the external parts have been antiseptically prepared, the scrotum is made tense by drawing it downward, when a two inch incision is made over the most prominent part of the dilated veins; after the skin and fascia are divided the remaining soft structures are separated by blunt dissection, being careful not to injure the vas deferens and its accompanying vessels. The exposed dilated veins are then ligated in two places about an inch and a half apart and the intervening portion cut away with scissors, the wound is then cleaned with sterile saline solution and the borders united with several catgut sutures, provision being made for drainage. The external dressing should be sterile gauze and the scrotum is to be supported upon a pad of cotton or wool while the patient remains at rest in bed. The drainage gauze can be removed in three or four days, and the wound will be healed in two weeks, but the scrotum should be supported by a suspensory for some weeks after the patient is up and about.

PHLEBOTOMY

The incision of a vein for the purpose of withdrawing blood is not practiced as frequently now as it was formally, although it is occasionally resorted to by some surgeons in apoplexy, with

a full strong pulse, aneurysm, uremic intoxication and in the early stages of pneumonia in the plethoric.

The median vein in the arm is usually selected as the most accessible vessel from which to abstract blood, although the operation may be about as easily accomplished on the external jugular or saphenous vein of the leg.

Preparatory to the operative work the skin over the vessel should be rendered aseptic by washing the part with soap and water followed with alcohol. If the blood is to be taken from the arm a rubber cord should be passed twice around the limb four inches or more above the point of incision, drawn tightly and tied. A short incision is next made through the skin and fascia with a sharp scalpel, the arm of the patient is then steadied with one hand while the point of a sharp lancet is introduced into the vein at its presenting surface, care being taken not to thrust the blade entirely through the vessel. The blood is caught in a suitable bowl which should be close at hand when the incision is made. After eight to ten ounces of blood has been taken the constricting rubber band should be loosened and a pad of sterile gauze applied over the wound and secured with a few turns of a two inch bandage.

ATHEROMA

Certain diseased states of the system beget a morbid state of the arteries, that causes a degeneration of their coats, and results in a calcareous deposit on the inner surface of the arterial vessels at some vulnerable point. This deposit at first is soft and friable, and is deposited from the blood little by little, until in some cases the lumen of the vessel is entirely plugged, and if the main artery of the leg or arm becomes thus affected gangrene of the part below the obstruction is apt to follow.

None of the larger arteries are exempt from the calcareous deposits; the aorta being, perhaps, more often the seat of the morbid state than the other arterial trunks. The femoral, tibial and fibial arteries are frequently the seat of the deposit, and usually in the order named. In the early stages of the disease the thin layer of the chalky material is hardly discernible Outside of the hardness of the coats of the vessel the nature of

the affection would hardly be suspected. In the more advanced stages the vessel, under pressure, feels hard and knotty along portions of its course.

Of course the circulation in the diseased vessels is impeded in proportion to the extent of the deposit, and that part of the limb deprived of the normal amount of the nutrient fluid is numb, and to a certain degree lifeless. Seldom is this affection observed in persons under fifty years of age, the gouty and rheumatic being the most liable to the ailment. Not infrequently is the atheromatic state of the arteries associated with aneurysm. When such is the case, ligation of the arterial trunk to cure the aneurysm is fraught with more or less danger from rupture of the fragile coats of the vessel by the constricting strand. Another complication that results from atheromatous conditions of the arteries is the detachment of portions of the calcareous deposit, which is carried along in the current of blood until it finds lodgment at some part of the vessel, around which, sooner or later, other deposits collect in quantities sufficient to completely plug the vessel at that point. When such a condition exists pulsation in the main artery ceases, and that portion of the limb beyond the obstruction is kept in a normal condition through the collateral circulation.

A marked diagnostic indication of a deposit of calcareous matter along the inner coat of the artery is the character of the pulsation of the vessel. This is especially noted, by sphygmographic tracing, in atheromatous disease of the radial artery. The upward stroke is decidedly vertical, and the summit of the tracing more extended than is shown in the normal state of the artery.

It has been stated that rheumatic and gouty states of the system were likely causes of atheromatous conditions of the arteries, but intemperate habits and exposure to great hardships are also marked predisposing causes.

Treatment. The treatment will depend altogether upon the existing cause of the morbid condition of the arteries. If the diseased state be due to intemperance, or great exposure, or overwork, these habits should be corrected at once, as little can be accomplished by medicinal measures except the physical conditions are rendered favorable for their action.

Errors of diet should be corrected at the outset, and functional wrongs righted, in so far as possible, through hygienic measures. Mental worry and physical hardships should be avoided. Acid states will call for alkaline remedies, of which the citrate or acetate of potash, in small doses, well diluted, should be given the preference. Lithia water should be drunk in large quantities, and rest enjoined.

Peptics, tonics and stimulants are prescribed according to the demands of each individual case. Aneurysm is to be treated by ligation when conditions are favorable.

PART TEN

Lesions of the Lymph Channels

LYMPHANGITIS

Inflammation of the lymphatic vessels is frequently met with in general surgical practice; it is generally the result of infection hence the morbid condition is usually observed in connection with wounds. It may also result from certain exposure that sets up a cellulitis as may be seen following extreme heat and cold.

Suppuration germs are alone responsible for the morbid condition of the lymph canals, especially the streptococci. As soon as the lymphatic vessels take on inflammatory action, they, becoming channels for the conveying of the morbid fluid from the point of infection to the lymph glands, enlarge and feel hard and cord-like under pressure of the finger. In cases where the infection is pronounced, the lymph glands become so impressed with the poison that they not infrequently break down in suppuration.

The common symptoms usually accompanying inflammation of the lymph ducts are tenderness on pressure, pain on motion, rigors, more or less fever, headache, red lines extending over the course of the vessels and swelling and edema of the affected parts. When one or more of the lymph glands suppurate, local swelling and fluctuation marks the change. In grave cases of septic intoxication, the patient soon passes into a state of malaise and physical prostration.

Treatment: In the early phases of the disease, some benefit may be obtained from the internal administration of remedies. With a high fever and developing symptoms of local infection, the patient should be given a liberal dose of the saline cathartics and frequent sponging with salt water, and in connection, the following prescription should be administered:

℞.
    Spc. Tr. Aconite .... gtt. x
    Spc. Tr. Echinacea .... ℥ iij
    Camphor Water, q. s. ....fl ℥ iv
    M. Sig.—A teaspoonful every hour or two.

To overcome the glandular swelling and the local inflammatory state of the tissues surrounding and including the lymph vessels, rhus tox and phytolacca should be alternated with the other mixture. Much relief may be obtained from the following mixture painted over painful areas while taking the above remedies:

℞.
    Spc. Tr. Veratrum .... ℥ j
    Witch Hazel .... ℥ ij
    Tr. Opium .... ℥ ss
    Aqua q. s. ....fl ℥ vj
    M. Sig.—Apply with a camels hair brush.

Locally to the infected wound, gauze or cotton, wet with some potent antiseptic solution should be applied. If the wound is inflamed, the alkaline mixture should be used; otherwise a bichloride solution should be relied upon, especially if the traumatism is discharging a thin, watery fluid; 1-5000 is the strength generally used, although a stronger solution may be required at the outset. If an accumulation of purulent fluid takes place near the point of infection, the abscess should be incised and the cavity washed out with the antiseptic wash.

The patient will do better to be kept at rest in bed and put upon a spare, but nourishing diet. To quench thirst, he should be allowed lemonade, and a drink made by stirring a teaspoonful of fruit jelly in a glass of ice water.

LYMPHEDEMA—ELEPHANTIASIS

Lymphedema is a morbid condition of the skin and sub-cutaneous tissues usually found associated with diseased conditions of the lymph channels.

The characteristic features of the disease are the discoloration and hypertrophy of the skin in the earlier stages of the malady, with edema and ulceration supervening as a later phase of the disease. To such extent does the hypertrophy reach in some cases, that unsightly deformities often result.

The morbid affection may attack any part of the body,
is frequently observed in the feet and legs. The external ge
talia is the next common point of attack, the spongy tissues of
swelling to a great size.

Fig. 70.—Congenital hypertrophy of the right leg.
(*Farnum.*)

The affection is not as frequently met with in this cour
as it is among the natives of tropical climes. It is supposed
be due to a parasite (filaria sanguinis hominis) which finds

way into the skin structure, and it may originate from trauma-
tism; in either case, the blood becomes infected as well as the
fluid in the lymph channels, the latter setting up an active inflam-
matory action, obliterating the lymph ducts, resulting in infiltra-
tion of the surrounding tissues.

The local changes in the affected tissues commonly observed
are the coarse hypertrophied condition of the skin, which often
remains in thick folds, and the pigmented discoloration of the
parts involved. In marked cases there is a foul oleaginous dis-

Fig. 71.—Congenital hypertrophy of the lower extremities.
(*Farnum.*)

charge, oozing from the surface of the diseased area, which not
infrequently macerates the surface to the extent that superficial
ulcers form, that are difficult to heal.

Where extensive areas are involved in the disintegrating
disease, the patient will experience rigors, hectic fever, muscular
pain, and general prostration. When the disease attacks the gen-
italia of the male, the scrotum often becomes involved in a

morbid growth of great size, and the labia majora of the female assumes proportion notably burdensome to the patient.

The treatment of lymphedema by medicinal means is very unsatisfactory, except in the early stages of the disease; the suc-

Fig. 72.—Congenital hypertrophy of the middle finger in a boy thirteen years old. (*Farnum, Ridlon.*)

cess to be obtained even here, will depend upon the primary cause of the ailment. When the feet and lower limbs are the seat of the disease, the patient should keep the recumbent position much of the time and is advised to partake of a spare, but nourishing diet.

The remedial treatment advised in lymphangitis will be effective in this morbid condition of the circulatory system and the

Fig. 73.—A marked case of elephantiasis. (*Laidlaw and McIntire.*) —Farnum's Surgery.

abnormal changes taking place in the skin. To prevent swelling and to support the tissues, the limbs should be bandaged and

kept elevated much of the time. If the system seems depleted, peptics and tonics can be given with benefit.

Amputation of a limb should be resorted to whenever the disease renders it so burdensome that it is of no use to the patient. Elephantiasis of the genitalia cannot be cured by any known remedial measures, hence the morbid growth should be removed by incision, either partial or complete. When the disease attacks the scrotum and it becomes necessary to remove the growth by ablation, the penis and testicles should be saved when possible and enough integument from the adjacent parts to form flaps sufficiently large to cover in the trauma.

Active hemorrhage attends operations for the removal of tumors of this character, hence the necessity of picking up, with hemostats, vessels as they are divided as the operative work proceeds and secure them with ligatures.

MALIGNANT LYMPHOMA—HODGKIN'S DISEASE

Malignant lymphoma is a grave disease of the lymphatic vessels and glands, more particularly the latter, which takes on a slow growth and is composed of lymphoid tissue. The tumors usually have a distinct capsule and while they have a tendency to spread and involve adjacent lymph glands, seldom, if ever, does the morbid process attack the blood-vessels or other surrounding organs. The disease does not attack the lymphatic channels in a general way, only that part of them exhibits morbid changes that enter the glandular structure.

The neck, axillæ, groins, and abdomen are common locations for the disease to manifest itself, the growths there often coalesce, forming a tumefaction of large size, causing more or less pain and discomfort through pressure on important nerves and vessels: In the neck the growths often interfere with efforts at deglutition and respiration.

Serious cases of lymphoma frequently eventuate in marked conditions of anemia and great physical prostration and not infrequently terminate in death, especially when the lymph glands of the abdomen become the seat of the disease.

The tumors are seldom painful to the touch, and are quite

movable when force is displayed upon them; they seldom break down in suppuration, unless infection germs find their way into the growth from some existing trauma.

The malignancy ascribed to this form of growth, is due to the anemia, cachexia, and great physical prostration that usually accompanies the morbid condition.

In some phases of the disease, the symptoms simulate those observed in sarcoma, glanders, syphilis, lymphangioma and some external affections of tuberculosis. A differential diagnosis can only be made by referring to the general symptoms of these affections.

The patient exhibits no rise of temperature or other evidences of inflammatory action, for none exists; nor is the general health impaired, except as previously noted, viz: when the growths press upon important vessels and nerves, or encroach upon the pharynx and larynx.

The cause is supposed to be due to factors originating in certain phases of sarcoma and tuberculosis.

Treatment: The treatment in the early stages of the disease should be confined to the administration of tonics and alteratives to sustain the general health and remove the taint of constitutional ailments, in so far as possible, that may be responsible for the glandular affection.

The following prescriptions taken in alternation will have a marked effect toward the removal of the cacoplastic material existing in the blood:

R.
  Spc. Tr. Phytolacca............................. ℥ ss
  Spc. Tr. Iris Ver. .... ℥ j
  Glycerine .... ℥ij
  Peppermint Water, q. s. ....fl ℥ iv
M. Sig.—A teaspoonful every two hours.

℞.
  Fowler's Solution .... ℥ ss
  Syrup Trifolium comp. q. s. ....fl ℥ iv
M. Sig.—A teaspoonful taken in alternation with the above.

The X-ray has been used locally with seemingly good results in the early stages in some cases, and has utterly failed to reduce the nodes in others.

Surgical measures have been resorted to in some cases with only temporary benefit however. Where much pain is experi-

enced from pressure or where the tumors in the neck are found to encroach upon the larynx, causing difficult respiration, portions of the morbid mass should be excised and the wound treated antiseptically. A fatal termination can be looked for in advanced cases.

TUBERCULOSIS OF THE LYMPH GLANDS

Tuberculosis of the lymph glands of the system is frequently met with in general practice. The swelling of these glands is due to the presence of tubercular infection and if not checked in the early stages of the morbid process, suppuration of one or more nodes frequently follows and coalescing forms an abscess of a considerable size.

The development of these glandular growths is much slower in some individuals than in others, which is due, in a great measure, to the resisting powers of the patient; where this is great, the infection becomes modified in the course of time and the glands mostly disappear. As previously remarked in another part of this work, true tubercular deposits do not break down in suppuration, unless secondarily infected with septic germs. A common location for the disease to manifest itself, is in the cervical region, the axilla and groin, where both sides become infected at the same time.

In the cervical region, the growth often attains to such a size as to give a disfiguring appearance to the individual, besides the discomfort experienced from stiffness of muscles and pain caused by pressure against important nerves and vessels.

The source of secondary infection of the cervical lymphglands are the tonsils, decayed teeth and the ears, that are affected with suppurative disease.

During the early stages of the glandular affection there are no diagnostic symptoms other than the gradual enlargement of the lymph nodes, noted in the neck or near the surface in other portions of the body. The little growths are movable, free from inflammation and are seldom tender on pressure. If the infection occurs, however, the growths become more adherent to the adjacent tissue and fluctuation quite easy to obtain as soon as suppuration takes place. At this stage of the disease the

patient will have rigors, hectic fever, thirst, night sweats, loss of appetite and physical decline to a certain degree. If the purulent fluid is not evacuated by incision, it will sooner or later slough its way through the skin and fascia, leaving a suppuration sinus that will be a long time in healing. The glandular affection being the result of the systemic invasion of the tubercular disease, the prospect of a cure is uncertain; unless the tendency to tuberculosis eventually yields to proper hygienic and remedial measures, the lungs sooner or later become involved, the debilitating disease in time terminating fatally.

Treatment: The treatment of tubercular disease of the lymph glands should include both hygienic and remedial measures. The former includes good food, properly prepared, and taken in liberal quantities. Water should be drunk freely to flush the kidneys. Exercise in the open air should be an every day practice.

The employment of remedial agents should be for a double purpose, viz: to improve the nutrition of the blood and maintain the patient's strength. To accomplish the former, such potent agents should be given in alternation as arsenic, acid solution of iron, phosphorus, and the salts of lime. The latter will require strychnia, quinia, iron, dil. hydrochloric acid and the triple phosphates, together with good food, taken at regular intervals, such articles of diet as custards, jellies, pickled pig's feet, tender broiled steak, eggs, game and such fruits as are found to agree with the patient.

In the early stages of the affection, specific phytolacca and Donovan's solution taken internally will have the effect to retard the development of the lymph glands in most cases. These remedies should be taken in small doses and in alternation. Iodide of stronitum and potash will prove of great benefit in scrofulous conditions, especially if preceded by syphilitic disease. These potent agents should also be given in small doses, well diluted, as they will have to be continued over a considerable period of time.

Such cases as fail to yield to the above form of medicinal treatment should be subjected to surgical measures before the glands undergo suppuration and the system becomes sorely impressed by the absorption of septic matter. To remove the chain

of glands, a linear incision should be made over their course down through the skin, fat and fascia, exposing the morbid growths in the bottom of the wound. The upper one should be seized with a pair of forceps and while traction is made, the gland should be dissected free from the surrounding tissue with the handle of the scalpel or the point of a groove director. Often a whole chain of glands can be removed in this way. In later stages of the disease, after the glands have broken down in suppuration, they are more difficult of removal. The purulent fluid should first be evacuated and then the sheath of the gland, if it is still intact, should be dissected out.

In the former case, the external wound may be closed with the interrupted catgut or buried silk-wormgut suture without drainage, but the suppurative cases will require provision for drainage in closing the wound. Bichloride solution (1-5000) should be used to cleanse the abscess cavity at first, later substituting the alkaline mixture or some other potent antiseptic wash. The external wound should be dressed with antiseptic gauze, which should be held in place with strips of adhesive plaster or a few turns of a roller bandage, when this is feasible.

PART ELEVEN

Morbid Condition of the Muscles, Tendons and Bursa

HOUSE-MAID'S KNEE

House-maid's knee is one form of bursitis that is generally produced by pressure. The part affected is the prepatellar bursa which first becomes inflamed and following this action, the bursal sac gradually fills with a fluid, clear and thin at first, but later it becomes thicker and more of the consistency of jelly.
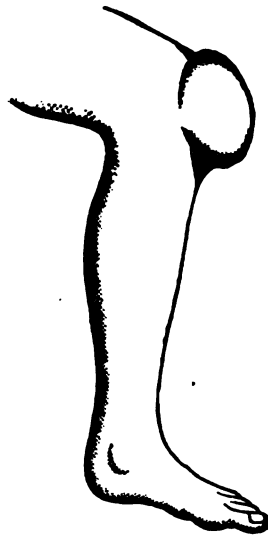
Fig. 74.—House-maid's knee. (*Howe.*)

Individuals are subject to the affection, whose occupation requires them to remain upon their knees for prolonged periods of time, hence these tumors are frequently observed in bricklayers, sorters of fruit, gardeners, and women who scrub floors.

These cystic developments are seen in various sizes and

forms, the larger growths giving little trouble, except its unsightly appearance and the difficulty of getting about.

Treatment: The treatment of this form of bursal tumor is by incision, evacuating the inflammatory fluid and bandaging; using careful antiseptic precautions to prevent infection. To prevent a refilling of the sac, its lining membrane should be swept over with a pledget of cotton, wet in pure carbolic acid, care being taken that an excess of the caustic fluid be not left in the bursal cavity to cause sloughing. Following this course, the knee should be bandaged as in the previous case, and the patient placed at rest in bed.

Some surgeons advise evacuating the inflammatory fluid through a puncture made with a trocar and canula and before withdrawing the latter a suitable portion of the tincture of iodine, thuja, or a few drops of pure phenic acid forced through it into the sac, which should then be manipulated so as to force the escharotic into all parts of the cavity of the cyst.

MINER'S ELBOW

Men engaged in the occupation of mining frequently have bursal tumors develop upon the elbows as a result of frequently bruising the same against the sides of the tunnels in which they work.

The affection involves the bursa, extending over the olecranon and usually develops to the size of an egg, but may attain a much larger size.

During the early stages of the development, the tissues at the point of the elbow are inflamed and tender to the touch, and the use of the arm is somewhat crippled as the growth enlarges. Not infrequently the inflammatory action extends to the adjacent tissues about the joint, setting up eventually, an active cellulitis, and occasionally the osseous structures composing the articulation break down under the influence of the inflammatory disease.

In the early phases of the affection there is heat, pain and tenderness in connection with the swelling; the function of the elbow is more or less crippled, and the arm is usually carried partially flexed.

Treatment: If the nature of the affection be determined early, the arm should be placed at rest and cold, wet applications applied to subdue feverish states. Witch hazel and water or arnica and water, will serve a good purpose here, as will the following mixture:

R.
    Carbonate of Potash .... ℥ j
    Tr. Opium .... ℥ v
    Aqua .... O j
  M. Sig.—Apply to the inflamed part every two or three hours.

The cases that go on to suppuration should be incised and drained under antiseptic precautions.

BURSITIS

Bursitis is a term signifying an inflammation of the bursa or sac, surrounding the articulations, and other prominent parts where tendonous action is aided by brusal sacs, as is observed about the cartilaginous pulley in the orbits, and about the synovial sheath of the digastric muscle, as well as about the sheath of the tendon of the long head of the bicep muscle.

Bursitis may be due to a severe strain or long continued friction, but is usually due to direct injury to the affected bursa. The affection, as to character, is divided into' the acute and chronic stage, and as to structure involved, may be superficial or deep. The superficial form of the disease is usually characterized by a thickening of the bursal sac, including the lining wall, and generally devoid of inflammatory fluids, while in the deep form of the affection there is an accumulation of synovial fluid which, in grave cases, may contain blood and pus.

In the acute stage of the disease there is present heat, pain, redness, local tenderness, and swelling, with limit of motion, while in the chronic form, heat and pain are usually absent, the local enlargement with more or less limit of motion, being the predominating symptoms. The morbid state may go on to suppuration, infecting a wide-spread area.

In the acute form of the affection, the treatment consists in the topical application of cooling applications, strapping with strips of adhesive plaster, or bandaging and placing the part in an elevated position when possible, and at rest. Under this

form of treatment, should the morbid condition not improve, aspiration will have to be resorted to. In the chronic form, incision is usually necessary in prominent parts, followed by packing or drainage; or the sac may be aspirated and injected with a few drops of pure carbolic acid.

DUPUYTREN'S CONTRACTION

A contraction of the palmar fascia extending to an involving the sheaths of the flexor tendons of the fingers, is known as Dupuytren's contraction. Besides the contraction, the structures involved are usually thickened, indurated, and decidedly unyielding.

Many causes have been given to account for the morbid condition, such as rheumatism, gout, occupation, traumatism, and lesions of the nervous system, any one of which, if its force be localized, may provoke the abnormal state of the fingers. Some force is lent to the suggestion that the morbid state is due

Fig. 75.—Condition of the tendons in Dupuytren's contraction. (After *Farnum.*)

to certain occupations, especially where heavy lifting is required, from the fact that the deformity is noted chiefly in men during middle life, the period of their greatest activity.

The flexion generally takes place in the little or ring finger, although any one of the other fingers may be affected in like manner, at about the same time the subcutaneous structures in the palm of the hand are found to be tense and hard, especially when an attempt is made to straighten the partially closed digits. In time the skin becomes attached to the fascia and cannot be made to move beyond the limit of that of the fascia. In the

majority of cases, the disease grows progressively worse, until the fingers that are affected are drawn well down into the palm of the hand, where they are rigidly held.

Treatment: The treatment in the early stages of the disease is by the use of a splint or other apparatus, so adjusted to the hand and fingers, as to keep the latter well extended much of the time. Operative measures should be advised in advanced cases, by the method best suited to the conditions of the individual case. If there exist bands of scar tissue, it may be possible to divide them subcutaneously with a tenotome; if these bands are extensive, it may be necessary to divide them through an

Fig. 76.—Contraction of the fingers in Dupuytren's contraction. (After *Farnum.*)

open incision in the skin of the palm. After the division of all adventitious tissue, the fingers should be forcibly straightened and secured by some form of splint to keep them extended.

If the open incision method is employed, the skin may have to be dissected free from the contracted fascia, when the latter may be cut away sufficiently to release the fingers from their deformed state. To expose the contracted fascia, longitudinal incisions should be made in the integument and the flaps dissected to either side sufficiently to accomplish the work required. Several of these incisions may be required to reach all of the contracted fascia. The finger should be held extended during and subsequent to closing the cutaneous incisions.

Aseptic measures should mark every step of the operative procedure.

GANGLION

A ganglion or weeping sinew is a cystic development on or within the sheath of a tendon, and is usually observed on the extensor tendons of the wrist and the anterior part of the ankle. The cyst is usually movable, round, fluctuating to the sense of touch, produces more or less pain on motion, and lessens muscular force.

The character of the fluid contained in these cystic growths is of a gelatinous nature and in many instances, if left undisturbed, becomes transformed into a cartilaginous mass.

The cause of weeping sinews is usually found to be a twist or sprain of the tendons of the wrist or ankle, produced by wringing clothes or falling heavily upon the hands, and turning of the ankles when walking.

Treatment: The treatment of ganglion is by incision, which is done with a tenotome, evacuating the jelly-like fluid through the small opening, when the cyst is so situated that this procedure seems practicable; this done, a suitable compress should be applied and retained by bandaging. If the cyst be large, its secreting membrane should be destroyed by sweeping over its surface a swab dipped in pure phenic acid, following which, the same dressing should be adjusted as advised in the smaller tumor. Injecting the cyst with the tincture of iodine, and obliterating the sac by a blow, dissipating its contents in the surrounding tissue, is not commended as a general treatment; severe inflammatory conditions have frequently followed the latter procedure, resulting in suppuration, necessitating incision and drainage.

ATROPHY OF MUSCLES

Progressive atrophy of muscles is a chronic disease, characterized by a gradual wasting away of the muscular tissue, associated in most cases with degeneration of the anterior columns of the grey matter of the spinal cord.

The causes of the morbid state are in the main obscure. Injuries to the spine and exposures are cited as possible causes by some. Heredity and constitutional taints are given by others. It is most frequently met with in childhood and early

adult life; it occurs more frequently in the male sex on account, perhaps, of the greater exposures that they are subjected to.

Some writers recognize two distinct forms of the disease; the spinal, and the muscular, claiming that the former occurs more frequently after puberty from injuries to the spine and the latter either as a congenital defect or from some hereditary taint. Distinctive features of the spinal form, are wasting palsy, progressive muscular atrophy, chronic poliomyelitis, and Charcot's disease. The muscular form is characterized by the various groups of muscles that are primarily affected, one group are those of the face, arm, and shoulder muscles, .another are those of the arm, back and thigh, while another may affect the muscles of the foot and all of the extensor muscles of the leg.

The symptoms diagnostic of muscular atrophy are progressive weakness in certain muscles which become graaually wasted and shrunken. This condition may at first manifest itself in the muscles of the back and leg in children, in the thumb, shoulder or upper part of the arm in adults. It is possible to arrest the progress of the disease in one group of muscles, only to have it appear in another with, perhaps, greater force, till many, if not all, of the voluntary muscles have been attacked. The muscles of the eyes, eyelids, and those of mastication are generally exempt from attacks of the disease. When the muscles of the hand are involved, there is a certain degree of contraction present, drawing the fingers toward the palm of the hand, giving it a claw-like appearance. The mind always remains clear, and the sensation in the affected muscles unimpaired, except when the disease affects the posterior horns of the cord, then pain, generally severe in character, often accompanies the affection. When death results from the morbid condition, it is due to asphyxia, brought about by the wasted and weakened condition of the muscles involved in the respiratory movements, the intercostal muscles and diaphragm in particular. Organs that are supplied with the sympathetic system of nerves, as the bladder, rectum and heart, are seldom crippled in their functions. Deformities of the feet, legs, and spine not infrequently occur as a result of marked muscular contraction.

Treatment: The treatment consists in improving the general condition of health, by correcting wrongs of digestion and assimilation, and other functional derangements. Peptics, tonics and stimulants usually find a place along the line of treatment in these chronic cases. Strychnia in small and repeated doses, administered hypodermically, always favorably influences the weak and shrunken muscles. Electricity is of great benefit in long standing cases, with cold and clammy skin and poor circulation. Massage with brisk friction is also of much importance in grave cases.

The diet in these cases should be both nourishing and stimulating; eggs, milk, malted milk, ice cream, the juices of meat, jellies, stewed fruits, pigs feet jelly, chipped beef in cream gravy, and stewed corn will form a fair list of dishes to draw from and in connection the patient should be kept in the open air and sunshine, but protected from sudden changes of temperature with suitable clothing.

Deformities due to muscular contraction will usually require a division of tendonous structure followed by forcibly placing the deformed part in a normal position and retaining by splints or other apparatus till the severed tendons have united.

MYOSITIS

Myositis signifies inflammation of muscular structure; this condition may be the result of an injury or disease and usually becomes manifest by the presence of swelling of the part, attended with tenderness and pain.

Treatment: The treatment is usually rest, and the internal administration of aconite, gelsemium, rhus, macrotys and the topical application of cooling lotions, of which the following mixture is most efficient:

```
R.
    Menthol Crystals ...........:...................... gr. xx
    Camphor  ...............  ..........................  ℥ ij
    Alcohol  ..........................................fl  Oj
    M.  Sig.—Apply to affected areas every two or three hours by
        spray or rubbed upon the surface.
```

Hot fomentations applied to inflamed muscular areas will often promptly relieve the morbid conditions.

MORBID CONTRACTION OF MUSCLES

Morbid contraction of muscles is due to several causes, lief of which are the presence of tumors, deep ulceration, aumatism and lesion of the central nervous system.

When the muscles of the arms or legs are affected, more or ss deformity exists, through extension or flexion of the whole · part of the foot or hand. If the contraction be due to irri- tion of some one or more of the nerve centers, the muscle · group of muscles are usually held in a state of spasm and the :formity is permanent while the irritation exists.

The morbid state is sometimes attended with soreness id slight pain, especially when due to irritation of one or more ' the nerve centers or trunks, otherwise, no distress accom- inying the affection is noted.

Treatment: The treatment will depend upon the cause of ie morbid condition; if this can be ascertained, it should be re- oved at the outset. Irritable conditions require rest and the iplication of soothing agents. Other cases may require mas- ge, and extension, tenotomy and tendon grafting. Brain sions will have to be treated as the individual case will suggest.

HERNIA OF MUSCLES

Not infrequently the envelope of fascia enclosing muscular ructure, gives way under great strain, allowing a portion of ie muscle to protrude through the vent. At the time of its currence, there is felt a sharp twinge of pain and a feeling · soreness and slight distress follows as a portion of the iiscle emerges through the unnatural opening. In cases where e protrusion is pronounced, a tumefaction can often be felt neath the skin and fascia. The use of the limb is often at- ided with more or less pain, following the injury.

Treatment: The treatment of this morbid condition is iinly by surgical measures. If the injury to the sheath is ght, it may be overcome by the placing of narrow strips of ic oxide adhesive plaster across the injured area to prevent rther extension of the vent. Bandaging may accomplish as ich, especially if the vent in the sheath occurs where compres- in upon the area can be had. When the degree of separation

is more extensive, no treatment short of cutting down upon the
traumatism, freshening the margins of the fascia and uniting
them with a continuous catgut suture, will prove effective.

RUPTURE OF TENDONS

The sub-cutaneous rupture of one or more tendons, caused
by a violent strain, directed upon these structures, is of quite
common occurrence. The accident is observed more frequently
about the ankle than the wrist, and when it occurs, the loss of
function is very marked, and the recovery is slow.

The tendon generally gives way with a snap that is often
heard by the patient, who immediately experiences sharp, cut-
ting pain in the injured part, and if the traumatism occurs
near the ankle or knee joint, effusion is a frequent complication.

If the injury be to a tendon of minor importance, the limb
should be placed at rest in a relaxed position, with the adjust-
ment of such local dressing to the injured parts as the case will
suggest; usually an injury of this nature does well with a plaster-
of-Paris dressing, snugly applied, to give support during the
healing process. Strips of adhesive plaster (oxide of zinc) so
applied as to give support to the injured tendon, affords a very
convenient dressing. In dealing with a rupture of the larger
tendons, the uniting of the divided ends, direct or by lengthen-
ing one end of the tendon, by splitting and turning down the
detached section, can be done through an open incision.
The ligatures used should be catgut or silk, to join the ends of
the tendons. The limb should be kept at rest for about six
weeks, and longer, if the nature of the case demands it, and
during this time, the parts should be kept securely fixed by the
application of suitable splints.

AFFECTIONS OF MUSCLES

Muscles, being highly endowed with nerves and blood ves-
sels are subject to neuralgic pain and inflammatory action: the
former is usually the result of inflammation and varies in degree
of severity. It frequently follows acute attacks of rheumatism,
and infectious fevers, also gout, gonorrhea, syphilis, and poison-
ing by some of the metallic salts. Acute inflammation of mus-

cular tissue is not infrequently produced by sudden changes of temperature, especially that of intense cold, and by traumatism.

The prominent symptoms are pain, soreness and distress, in attempts to exercise, with heat and often redness of the parts involved.

Treatment: The treatment will depend entirely upon the cause of the myalgia. When due to fever and the pain is acute, the following prescription usually brings prompt relief:

```
R.
    Spc. Tr. Aconite ............................... gtt. xv
    Spc. Tr. Gelsemium ............................. 3 ss
    Peppermint Water q. s. .........................fl 3 iv
M.  Sig.—A teaspoonful every half to one hour.
```

As the acute pain subsides, the muscles take on a sore or bruised feeling, which soon yields to the internal administration of macrotys. Rhus and bryonia are frequently indicated, also quinia, if the disease shows periodicity. Other measures that aid in the cure are rest, massage, stimulating liniments, topically applied, hot fomentations, and counter irritation.

TENOTOMY OF THE TENDO ACHILLIS

To overcome any form of club-foot caused by shortening of the tendo-Achillis, the tendon is divided an inch or more above its insertion into the posterior extremity of the os calcis.' The tenotomy is simple of execution and can be done under local anæsthesia. The sub-cutaneous method is the usual one adopted and is executed with a slender tenotome, after the foot has been rendered sterile in the usual manner. The foot is grasped with the left hand with the end of the forefinger resting along the outer side of the interspace, between the cord and the fibula, opposite the point where the knife is to enter.

The knife is held at right angles to the leg and the blade is made to enter flatwise in front of the tendon and thrust forward until its point can be felt beneath the skin on the opposite side. The cutting edge of the knife is then turned toward the tendon and made to divide it by short rocking, sawing movements, while the tendon is made tense by forcibly depressing the heel. As the last fibers of the cord are severed, they give away with an audible snap, and the foot at once becomes re-

laxed. The tendon having been severed, the knife is withdrawn in the same manner that it was entered; if care has been taken not to wound structures, other than the tendon, little blood will be lost in the operation. To overcome the amount of shortening necessary to place the foot in a normal condition, the toes are to be forcibly elevated, which will depress the heel, causing a gap between the ends of the divided tendon. This procedure gives rise to considerable pain, especially when the work is

Fig. 77.—Subcutaneous division of tendo-Achillis. (*Howe.*)

done under local anæthesia. Children and nervously inclined persons should be chloroformed to the degree of dulling pain. At the conclusion of the operative work, the wound may be closed with gauze and collodion or a piece of zinc oxide plaster.

Following the operation, the foot should be immobilized on a long splint with a foot piece attached to hold the foot at the required angle, or a plaster-of-Paris dressing, in which the foot should be kept at rest for about ten days, at which time the dressing should be removed, the foot bathed in salt water and then redressed in the immobilizing apparatus for another ten days, when, if conditions are favorable, it may be laid aside, the foot and ankle gently massaged once or twice a day, for a week

or more, when attempts to walk may be allowed with the aid of a cane or crutch.

The intervening gap between the ends of the divided tendon fills in with reparative material and becomes quite firm in three or four weeks.

SUTURING OF TENDONS

A not uncommon injury the surgeon is called upon to care for is severed tendons in the fore-arm and hands, ankles and teet. The work may be successfully done under strict antiseptic precautions and the function of the part fully restored.

The operation to prove successful must immediately follow the injury before the wound becomes infected. If one or two
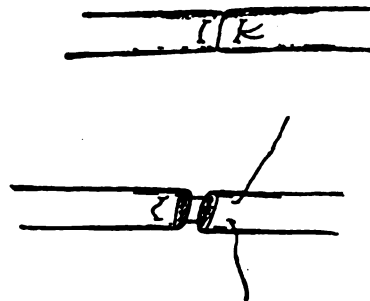
Fig. 78.—Tendon re-united by a single catgut mattress suture. (*McGrath.*)

tendons only are severed the ends may be picked up and united through a linear incision made each way from the wound along the line of the muscles or tendons. If the wound is extensive. several tendons being divided. their repair may require the dissecting back of a suitable flap to facilitate the work. On reaching the sheaths of the tendons the severed ends may be found well retracted especially the proximal ends, to reach which, the sheath will need opening up by a straight incision, the tendon grasped with forceps drawn down to meet the end of the distal portion of the severed tendon; holding the ends together they are joined by fine sterile silk sutures or fifteen day catgut placed horizontally.

Tendons are more easily joined together by suturing than is a tendon to the muscle from which it has been separated by

violence. The sutures do not hold well in muscular structure
and the tendon may have to be lengthened by cutting and splic-
ing, to relieve in a measure, the strain on the sutures after they
have been placed. This should be done as a preliminary meas-
ure before the tendon is joined to the end of the muscle. Where
several tendons are divided, care should be exercised to join the
proximal end to each relative distal end of the same tendon if
possible, if this cannot be accomplished it must be joined to
some presenting end of tendon that seems to be in line of the
one desired. With the ends of the divided tendons united by

Fig. 79.—Two methods of lengthening contracted tendons.
(*Farnum.*)

suture and the hemorrhage checked, the external wound is closed
with catgut sutures, dusted with antiseptic powder, covered with
sterile gauze, bandaged and immobilized on a well padded splint
or plaster-of-Paris cast.

If necessary the stitches may be removed in a week or ten
days, following this period the fingers should be gently manipu-
lated if the operation has been done on the wrist or hand, and
the foot if the work has been done on the lower leg. Every pre-
caution is taken to get union by first intention, otherwise sup-
puration will surely defeat the purpose of the operative work.

By properly massaging the crippled muscles and tendons
functional recovery should be complete in six weeks to two
months.

PART TWELVE

Injuries and Diseases of the Nerves

ANASTOMOSIS OF NERVES

Gratifying success has followed the anastomosis of many of the important nerve-trunks of the limbs and superficial nerves of the neck and face, in cases where they have been accidently divided or attacked with disease. By this procedure, muscles that have become paralyzed to a certain degree, may have their functions restored to the extent that they will again become useful. The success following the operation will depend largely upon the lapse of time between the receipt of the injury and the execution of the operative work.

Functional activity has been restored to peripheral nerves and the muscles to which they are distributed, months and even years after the nerve-trunk was severed or lost its active force by disease, by nerve grafting or anastomosis with some nearby nerve branch. In paralysis of the facial nerve (Bell's palsy) following the disease of the nerve (not trauma), Brewer advises that anastomosis be not attempted for upwards of six months after the first symptoms of the morbid state become manifest; he assigns no reason for the delay in the operative work, but it is presumed that the disease might be only temporary and would subside in time, rendering the operation unnecessary.

To restore function to the facial nerve when palsied, it is joined to the spinal accessory or the hypoglossal, if for any reason, it can not be united with the former. The facial nerve is first exposed through a slightly curved incision, extending from a point behind the ear, opposite the external meatus downward and forward around the lobule of the ear to the angle of the jaw; the skin, fat, and fascia are divided down to the anterior border of the sterno-cleido-mastoid muscle, which is drawn well backward with a blunt retractor; next, draw the

posterior and lower border of the parotid gland forward, when the nerve may be exposed at the upper border of the digastric muscle; it should be raised on a blunt hook and divided well back with the scissors, the divided end being secured with a silk strand and held to one side, while the spinal accessory is secured; this nerve is exposed through the same external incision made to locate the facial nerve. It is found resting just beneath the deep fascia, which should be picked up with thumb forceps and divided with a grooved director. The nerve enters the sternomastoid opposite the angle of the jaw, where it can be raised on a blunt hook and exposed for about one inch, when
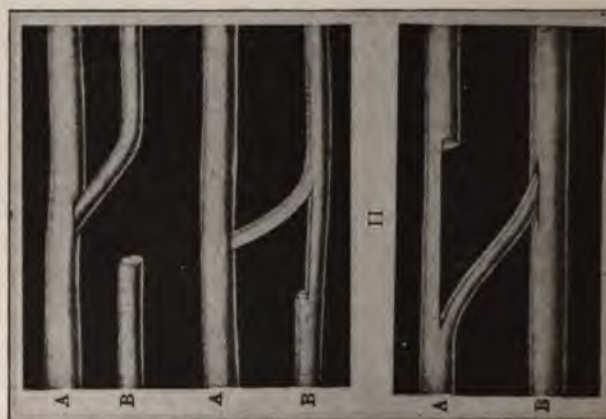
Fig. 80.—Anastomosis of nerves.

it is divided at the point where it enters the muscle; the ends of both nerves are then approximated and joined with a fine sterile catgut suture, following which the union should be surrounded with a nearby layer of fat or fascia, the wound should then be cleaned and closed, the work being done under strict antiseptic measures.

In operating upon crippled nerves in general in this manner for the restoration of function, where an end-to-end union is not feasible, a lateral anastomosis may be done by joining a sectional portion of an adjoining nerve to the crippled one by splitting the latter and introducing the end of the section rais-

ed from the adjacent nerve, securing it with a fine catgut suture, as shown in the accompanying cut.

Several cases of infantile paralysis have been reported cured or greatly benefited by nerve anastomosis by Brewer, Clark, and other surgeons who have given this form of treatment of palsy careful study. In brachial birth palsy, Brewer advises that at least six months should elapse after the birth of the child before an attempt should be made to remedy the morbid state of the nerves by operative procedures.

In executing a nerve anastomosis the union of a section or branch of an adjoining nerve to the crippled nerve-trunk should be secured, when possible, by passing a fine catgut suture through the sheaths of each nerve, instead of through the entire nerve structure.

ULCERATION OF THE FOOT

Individuals who have suffered frequent injuries to the plantar surface of the foot or whose occupation requires them to be on their feet much of the time, occasionally suffer from ulcers on the under surface of the great toe or ball of the foot. The disposition of these ulcers is to penetrate through the tough tissues of the sole of the foot producing a painful sore with no disposition to heal of its own accord or under the influence of the most potent antiseptics; this condition is brought about, no doubt, by an anæsthetic state of the terminal nerves of the part affected. Individuals suffering from diabetes, Bright's disease and other constitutional ailments are prone to attacks of this form of ulceration.

The prominent symptoms of this form of ulceration are lameness of the foot and local pain with no disposition to heal on account of the anæsthetic condition of the surrounding parts, which can be attributed to degenerative wrongs of the terminal nerves of the foot.

Treatment. The treatment consists in keeping the patient off his feet, moderate massage and the application, at first, of stimulating lotions. At the outset, if the parts adjacent to the ulcer are much inflamed, a pack should be applied wet in hot solution of borax and salicylic acid, following this the ulcer should

be touched with pure carbolic acid and subsequently dressed with balsam of Peru, iodosyl ointment, Meyer's ointment, or such other antiseptic agents as the individual case will suggest.

TORTICOLLIS—WRY NECK

Torticollis, or wry-neck, is an affection due to a contracted state of the cervical muscles which may be permanent or intermittent. By some writers the morbid state is classified into a congenital and acquired form. The former is often observed in children with club-feet or hands and other deformities; then it occurs as an arrest of development of certain cervical muscles thought to be due to a perverted force of the nerve centers. Intra-uterine positions of the head and neck receiving constant uterine pressure is a probable cause, as is force displayed upon the neck during delivery, resulting as it does in some cases, in rupture of the sterno-cleido-mastoid muscle. Deformity of the cervical vertebræ has, in numerous cases, resulted in a spasmodic contraction of one or more of the cervical muscles, producing a twisted state of the neck.

In the acquired form it may be due to traumatism followed with cicatricial contraction of the skin and fascia and the subjacent muscles; injuries to the cervical vertebræ, inflammatory states of the cervical muscles, deformities, and occupations causing an undue strain on the sterno-mastoid and other muscles; injuries to and diseases of the nerves that are distributed to the cervical muscles are common causes of wry-neck.

The symptoms observed in torticollis vary in nature and severity according to the provoking cause. Pain on motion is a pronounced symptom in all inflammatory states of the disease, traumatic injuries, diseases of the cervical vertebræ, and irritation of the nerve centers. It is an early symptom and soon gives way to a soreness of the parts. The distortion of the head is the most prominent symptom of the affection and causes more or less disfigurement and discomfort to the patient. This condition varies in degree according to the muscles contracted. With the sterno-mastoid affected, the side of the head is brought near the sternum, the chin carried to the opposite side and to a certain degree elevated; the latter phase of the affection is marked

when the trapezius and other posterior muscles are held in permanent spasm; when the twisting of the head is due to this state of the muscles the movements of the head in certain di-

Fig. 81.—Torticollis (wry neck) from habitual faulty position. (*Farnum.*)

rections, of necessity, must be limited. The muscles that are held in spasm can in most cases, be readily outlined by the sense of touch or manipulation with the fingers.

The spasmodic or intermittent phase of torticollis is observed more frequently in the acquired form of the affection. The distortion is not permanent, attacks more or less severe being brought on by undue muscular strain and nervous excitement, when the spasm of the cervical muscles ceases the head is held in a normal position, but is drawn to one side or backward according to the group of muscles affected. Those affected with this phase of the morbid state soon learn to grasp the head with the hands and hold it steady for a time when an attack of spasm comes on; assuming the recumbent position will often relieve the attack. It seldom bothers the patient during sleep. In either form of the morbid condition when the cervical muscles on one side are affected the head is drawn toward the shoulder, when the muscles on both sides are affected the head is usually drawn backward to a certain degree. In

permanent cases of long standing certain cervical and facial muscles that are disused often become more or less atrophied.

The diagnosis of wry-neck is easy; not so easy however to determine in all cases, the exact cause of the morbid state. The head and neck are held awry, the chin usually elevated above the normal plane; certain of the cervical muscles are held tense and feel hard to the touch, and the head is limited in motion. When the abnormal state is due to paralysis a clinical history of the patient's past physical condition will aid materially in forming our diagnosis. Spasmodic torticollis is due either to overstrain of the muscles or to disease of the cervical vertebræ; here again, the clinical history will in a measure determine the exciting cause.

Treatment. The treatment consists in alleviating the pain and distress and correcting the cause of the affection when this can be done.

Fig. 82.—Thomas' collar for the treatment of torticollis.

In congenital wry-neck the head should be put in normal position and retained there by braces or other immobilizing apparatus until the exciting cause has been overcome, which is usually a contraction of the sterno-mastoid muscle; if this is not done early in life, the muscle will require division later on, which is done near the clavicle through an incision in the skin made parallel with that bone, exposing the lower end of the muscle which should be completely divided. The operation is followed by some form of mechanical brace, adjusted so as to hold the head in a normal position. The brace or collar seen in the accompanying cut answers the purpose well and is com-

fortably worn. Well directed massage to the contracted muscles will aid in the mechanical treatment in mild cases. In dividing the sterno-mastoid muscle some care should be taken not to injure the important vessels and nerves lying adjacent to it. It well be well to pass a grooved director behind the insertion of the muscle before dividing it, which should be done with a blunt pointed tenotome.

There are many different forms of appliances in use for the treatment of wry-neck but they serve their purpose best, following the division of any and all contracted structures. If the operative work is done under strict aseptic methods there is little to fear from suppuration complicating the deep structures of the neck.

When the affection is due to rheumatism or other inflammatory causes, local applications of pads wrung out of hot water will be found alleviating; in this connection such remedial agents as are indicated should be given internally; usually aconite and gelsemium, bryonia and macrotys will find a place here and will materially aid in overcoming the local disturbance.

In the permanent spasmodic form of the affection the spinal accessory nerve should be exposed and stretched; if no benefit follows within a reasonable time it should be excised. Not much benefit if any, can be expected from remedial measures in these cases. Hygienic measures may be adopted in some cases with benefit; especially in those due to adverse influences, overwork, or overstrain.

To reach the spinal accessory nerve, to stretch or divide it, an incision is made along the anterior border of the sterno-cleido-mastoid muscle about three inches in length, extending downward from a point on a level with the lower lobe of the ear. The skin and fascia being divided, the muscle is pulled to the outer side, exposing the nerve about on a level with the upper part of the hyoid bone.

In extremely obstinate cases, where division of the spinal accessory nerve has failed to bring relief, resort has been made to the division of deep nerves of the posterior cervical plexus with pronounced success. Keen advises the division of the posterior branches of the first, second, and third cervical nerves and proceeds as follows: a transverse incision is made half an inch be-

low the level of the lobule of the ear dividing the skin and fascia, the trapezius muscle is exposed, picked up on a grooved director and divided with a blunt pointed bistoury in the same line. The muscle is then carefully dissected up from the underlying tissues where the great occipital nerve will be found, which should be followed by dissection until its origin from the posterior division is reached and divided. The first cervical or suboccipital is next picked up and incised. It will be found in the triangle close to the occiput formed by the two oblique muscles and the posterior straight muscle. The external branch of the posterior division of the cervical nerve is to be found a little lower down and should be divided close to the bifurcation of the main nerve. Following the division of these deep nerves, placing and retaining the head in the normal position with appropriate apparatus will be found necessary to bring about a cure.

NEURALGIA

Neuralgia is a painful state of a single or several nerve branches, and is due to various causes. It may appear in the absence of any evidence of inflammation, and it may occur in connection with such morbid action.

The pain may be paroxysmal or continuous; when it is of the former character the periods of pain may occur every few minutes, or it may not return for a day or two. The onset of every attack is characterized by sharp lancinating pain often causing a marked convulsive action in the muscles to which the affected nerves are distributed.

In continuous cases the morbid action frequently commences as a soreness of the nerve-trunk and its branches, which gradually increases in severity until the pain is almost unbearable, when it gradually subsides, unless the provoking cause cannot be removed.

Some persons have periodical attacks of neuralgic pain lasting for a week or more, coming on every spring or fall. No reason can be assigned for these attacks except it be that of a malarial origin which seems to be the most likely cause, observing that one or two potent doses of quinia and other antimalarial remedies soon terminate the attack.

The nerves most commonly affected, other than such as may become involved in callous or scar tissue following traumatism, are the trifacial, sciatic and its branches and the peripheral nerves.

The causes of neuralgia are many and yet attacks will occur where no reason for its occurrence is in evidence. Chief among the common causes of the morbid disease are exposure to extreme cold, traumatism, rheumatism, malaria, reflex irritation and metallic poisoning. Syphilis is also given as a provoking cause, also anemic conditions of the system. Other causes are mentioned by writers on nervous troubles but as they are largely speculative they will not be mentioned here.

The chief symptom noted in neuralgia is pain which varies in character from sharp and lancinating to a dull aching condition of the nerve. Neuralgia is not infrequently confounded with the distressing condition existing in neuritis, the differential diagnosis between the two affections lies in the fact that neuritis usually accompanies or follows some local inflammatory action, there is more or less tingling and tenderness of the nerve on pressure and trophic disturbance, if long lasting. Neuralgia is usually unilateral, unaccompanied by fever or inflammation, as a rule the pain is sharp and cutting in character and generally paroxysmal, while pressure over a nerve-trunk in neuritis will increase the painful state, in neuralgia it will give relief in a measure.

Neuralgic conditions are of special interest to the surgeon just as soon as remedial measures fail to give the necessary relief and the character of the affection is such that surgical measures are required to bring about a cure.

Treatment. At the outset the patient should be enjoined to remain at rest in bed and such remedies administered as the prevailing indications call for. If the neuralgia be due to an impinging of the nerve by callous or cicatrix, topical applications of the following mixture will bring some measure of relief:

℞.
 Menthol Crystals .... gr. xl
 Ether .... 3 j
 Spts. Camphor, q. s. .... fl 3 vj.
M. Sig.—Paint over painful parts ever hour or two.

Hot fomentations of hops and stramonium leaves will often

relieve pain when other measures fail. To give rest and promote sleep heroin in one-sixth grain doses given hypodermically at bed time will relieve the nervous system when racked with pain. A few drops of chloroform or ether introduced near the painful nerve-trunk with a hypodermic needle frequently brings, at least, temporary relief. Morphine, atropin, and cocaine have been used for the same purpose but the use of these drugs as well as the heroin should not be persevered in to the extent that the "habit" be formed for tippling agents.

For the permanent relief in neuralgia of the fifth nerve, aconite, gelsemium, matricaria, and passiflora, are often indicated and when they are used they prove rapidly curative. If the diseased condition of the nerve be due to a rheumatic diathesis with the specific indications for bryonia, macrotys, sticta, rhus, or aconite present, these remedies, given in alternation will usually prove curative. Lumbar and sciatic neuralgia is frequently alleviated with potent doses of macrotys and bryonia alternated with rhamnus Californica, or instead of the latter, apocynum should be substituted if œdema of the feet and legs are present.

Phenacetine, acetanilid and other coal-tar products are frequently given in neuralgic states of the nerves, and while they may relieve the painful state temporarily, they should be given with great caution, especially in the absence of fever, as their action is exceedingly depressing especially in patients made weak from long suffering with pain and loss of rest and sleep.

Galvanism is sometimes successfully used in chronic cases of neuralgia, especially when the nerves affected lie very deep and muscular weakness is a feature.

If permanent relief is not obtained after recourse to the remedial measures suggested above and the suffering still continues unabated resort should at once be had to surgical measures such as the individual case will suggest.

A neurectomy is advised in the severest type of neuralgia where the nerve-trunk can be approached with sufficient ease to permit of a small section of it to be removed. A section one-quarter to three-eighths of an inch in length should be cut away and the interval filled with sterile paraffin to prevent reunion of the divided ends.

Neurotomy or the division of a nerve-trunk is often executed

in cases of persistent neuralgia where the nerve lies deep in the tissues and for valid reasons a neurectomy is not feasible. Either operation can usually be done under local anæsthesia unless the patient be unusually nervous and excitable. Every precaution should be taken to prevent infection, otherwise the work will prove a failure. A neurotomy is quicker of execution and is usually followed by prompt relief but the reunion of the ends of the nerves through the process of repair is very apt to soon take place which not infrequently causes a return of the neuralgic pain.

Stretching a nerve-trunk is sometimes resorted to for the cure of aggravated cases of neuralgia made so through the action of inflammation. The sciatic is perhaps as frequently operated on by this method as any one of the more prominent nerves The nerve is exposed at the selected point by dividing the overlying soft structures by incision and blunt dissection with the handle of the scalpel. The nerve is hooked up wit!: the finger or blunt hook and after being separated from the surrounding tissues for two inches or more it is gradually stretched by traction for a few moments when it is allowed to assume its original position, after which the external wound is closed and dressed antiseptically.

If benefit is obtained from the operation it will become manifest at once following the operative procedure.

The necessary instruments required to do the above operations are one or more sharp scalpels, retractors, scissors, hemostats, blunt hooks, needles and needle-holder; with suitable material for sutures, ligatures and external dressings.

Several surgeons of note have been able to relieve the distressing pain experienced in nerve-trunks and their branches in grave cases of neuralgia, by injecting into their structure or adjacent tissue at some vulnerable point a few drops of a one per cent solution of osmic acid or eighty per cent alcohol; the former may be injected into bony canals through which the affected nerve passes with equally good results if the nerve-trunk at that point seems to be the part most readily assailable. Care should be taken not to allow the acid to come in contact with the skin surface as the agent quickly colors the tissues dark.

To Expose Special Nerves for Operation.

Supra-orbital. This nerve is reached through a curved incision made through the eyebrow an inch or more in length, extending slightly above the supra-orbital foramen. The nerve is usually imbedded in fat from which it should be freed by blunt dissection. To facilitate the work the nerve can be picked up with an artery forcep with which traction should be made to expose the supratrochlear branch back of which the supra-orbital is usually divided. The edges of the external wound should be accurately approximated and carefully closed to prevent the formation of much scar tissue.

The supra-orbital nerve may be exposed by any one of the several routes. The one method that is quite easy of execution, hence usually adopted by most surgeons, is to make a slightly curved incision along the lower margin of the orbit opposite the infra-orbital foramen, cautiously approaching the latter not to wound the nerve as it is found passing out through this opening and on beneath the levator labii superioris muscle. To reach the nerve rather high up it should be grasped with an artery forcep and held firmly while the surrounding tissue, which is mostly composed of fat, and the periosteum, is reflected back from that portion of the bone containing the infra-orbital canal which is then opened with a chisel and mallet, traction being then made on the nerve with the forcep; it is cut with scissors as far back as possible removing the external portion, after which the wound should be cleansed of blood and other fluids and closed with catgut sutures. If hemorrhage occurs it should be controlled by packing with small pieces of gauze.

To expose Meckel's Ganglion several methods are put in practice, the one following being not the most difficult of execution. After the proper preparation of the patient, a triangular flap is cut and raised by making a perpendicular incision from the infra-orbital notch to a point within an inch of the angle of the mouth, this incision should be intersected by a second one made horizontal and extending along the lower margin of the orbit. After exposing the infra-orbital canal, its floor should be opened as well as the upper part of the antrum with chisel and mallet; exposing the infra-orbital nerve it should be secured by

a silk ligature or forcep and used as a guide while the dissection goes on. After reaching the posterior wall of the antrum it should be opened up with a small trephine, being cautious not to wound the internal maxillary artery which lies in close proximity to this portion of the antrum cavity; control any hemorrhagic flow and then open the sphenomaxillary fossa still using the infra-orbital nerve as a guide backward and inward to the ganglion through the trephine opening. Any arterial twigs that may be divided should be picked up and ligated if possible, or twisted to stop the flow of blood, or the cavity should be temporarily packed with pledgets of sterile gauze; this may be left in place two or three days if the conditions require it when it may be removed and the wound closed in the usual way under local anæsthesia if need be; the after-dressings should be composed of antiseptic washes, powder, and sterile gauze pads and bandages.

The Inferior Dental Nerve is exposed for division or exsection at the dental foramen through an incision in the mucous membrane and underlying cellular tissues, keeping close to the jaw-bone during the dissection, aided by a mouth-gag and the tongue held to the opposite side with a silk strand passed through its tip. The nerve may be also reached through a curved incision at the angle of the jaw extending along its lower border two or three inches dividing the skin, fat, and fascia, exposing the masseter muscle, which should be separated from the jaw with a periosteotome aided by the knife or curved scissors. After baring the bony substance of the jaw it should be trephined a little back of the median line and somewhat over an inch above the angle of the jaw. By bearing in mind the anatomical relationship that the dental foramen bears to the angle of the jaw, not much trouble will be experienced in approaching the nerve direct with the trephine. Hemorrhage occurring from the divided blood vessels in either operative course pursued should be checked by forcipressure or packing.

The Gasserian Ganglion is sometimes partly or wholly removed for relief in persistent attacks of neuralgia. There are two operations in common practice by which the nerve structure may be reached, the Hartley-Krause procedure and that recom-

mended by Rose, either of which prove satisfactory when proper-
ly executed.

In doing the former operation the operator should have at
hand a scalpel, curved scissors, chisels and mallet, a small
periosteotome, and a small bone elevator, besides needle and
needle holder, catgut of various sizes, and material for bandages
and dressings.

After locating the ganglion by an X mark on the scalp a
horse-shoe shaped flap should be cut, extending from the poster-
ior extremity of the zygoma upward and forward along the tem-
poral ridge and then downward to the anterior extremity of the
zygoma. The soft structures are divided at one sweep of the knife
to the bone, the margins of the wound are separated sufficiently
to permit the divided vessels to be picked up and either ligated
or twisted to control hemorrhage. A number of trephine open-
ings are next made along the line of the incision and the inter-
vening spans of cranial structure cut away with the chisel, be-
ing cautious not to seriously wound the dura and the structures
beneath it. That portion of the skull beneath the soft structures
is next elevated with a bone-elevator, breaking the undivided
narrow portion just above the zygoma. At this stage of the
operation all bleeeding vessels should be picked up and secured.
The middle meningeal artery is especially liable to injury while
raising the osseous flap. To expose the superior and inferior
maxillary branches, the dura together with the brain is raised
from the middle fossa of the skull with the fingers and by trac-
ing them backward the ganglion is reached. The second and
third branches are exposed by retracting the overlying brain and
dura raised on a blunt hook and divided as far back as possible.
A considerable venous hemorrhage is occasioned by the dis-
section of the nerves back to the ganglion which may have to be
controlled by packing; the blood coming from the vessels of the
dura and the sinus which are very apt to be wounded during the
operative work. To remove the entire ganglion it generally be-
comes necessary to open the cavernous sinus; the operator should
have at hand hot sterile saline solution to flush out the hemorr-
hagic cavities and other bleeding points. Packing to control hem-
orrhage can be removed in a few minutes especially if the strips of
gauze be wet with adrenalin solution. After the removal of the

necessary amount of nerve tissue the wound should be cleared of blood with sterile saline solution, the bony flap including the soft structures readjusted and held in position with a few catgut or silk-wormgut sutures with provision made for drainage in the posterior angle of the wound. The removal of the Gasserian ganglion is a serious operation and should only be attempted as a last resort in the cure of persistent neuralgia of its several branches after other means have failed, especially that of injecting the nerve with a drop or two of a one per cent solution of osmic acid.

To Expose The Facial Nerve to inject, or otherwise operate upon it for the cure of obstinate tic douloureux Baum's method is usually chosen of making a curved incision behind the ear about three inches in length, beginning at a point opposite the external meatus and extending downward and forward around the lobule of the ear toward the angle of the jaw; the skin, fascia and fat are divided down to the sternomastoid muscle which after exposure is forcibly retracted backward and the parotid gland drawn forward with blunt retractors. Next control any hemorrhagic flow and seek the digastric muscle along the upper border of which the nerve is usually found, sometimes imbedded in fat. It should be raised with a blunt hook and injected with a solution of osmic acid as previously recommended in this article, or stretched by making tension upon it for a few minutes. The wound is then closed in the usual way and dressed antiseptically.

The Spinal Accessory Nerve is often divided, stretched, or injected to relieve severe attacks of spasm of the sternomastoid muscle resulting in what is known as torticollis. This nerve can be exposed through a three inch incision made along either the anterior or posterior border of the sternomastoid muscle extending downward and slightly forward from the lower point of the mastoid process in the former course and two inches and a half back from and on a line with the tip of the mastoid when the latter course is followed. The skin, fat and fascia are carefully divided down to the edge of the muscle which is drawn either forward or backward with a blunt retractor according to which of the methods is pursued. The nerve will be found at a point

opposite the angle of the jaw where it enters the sternomastoid muscle beneath the deep fascia below the muscle which should be picked up with dressing forceps and divided with the knife or scissors. The remainder of the dissection is best done with a grooved director, exposing the nerve which is picked up and stretched or injected and even divided, if the nature of the morbid condition justifies this course.

The nerve is also found about the middle of the posterior border of the muscle where it can be reached by an incision through the overlying soft parts. Stretching the nerve well is to be preferred to dividing it as paralysis of muscular structures to which the nerve is distributed is apt to follow the severing of the nerve. Following the operative work on the nerve the external wound should be cleansed and closed under antiseptic precautions.

To Expose The Musculospiral Nerve the external parts should first be thoroughly sterilized. An incision three inches or so in length is made in the overlying soft parts corresponding with the musculospiral groove that exists between the biceps and supinator longus muscles. The margins of the wound are well separated with blunt retractors and the fascia surrounding the nerve separated with the point of a groove director after exposing the nerve it should be raised with a blunt hook and stretched or injected as the individual case will suggest; this done the external wound is closed in the usual manner.

NEURITIS

Inflammation of a nerve and its sheath is not an uncommon ailment to meet with. It arises from several causes chief among which may be mentioned rheumatism, syphilis, gout, pressure, infectious disease, traumatism, and exposure to extreme cold. The affection may be acute or chronic and may affect a single nerve or several as may be noted in multiple neuritis; the latter affection is likely due to septic infection or to severe constitutional diseases. Under such conditions the nerve trunks become markedly changed in their texture, the fibers becoming soft and friable. Where only a single nerve trunk is involved it usually presents a thickened body and is very sensitive to pres-

sure. In appearance the nerve tissue is red and congested in the acute form but hard and atrophied in the chronic form.

The symptoms accompanying neuritis will vary in accordance with the exciting cause of the disease. As a rule there is, in the acute attack, a burning lancinating pain radiating over the area to which the nerve and its branches are distributed, which is worse at night and always increased by motion. In not a few cases a tingling sensation is followed by a feeling of numbness or an anæsthetic state of the parts to which the nerve branches are distributed. Paralysis, to a certain degree, of the motor nerves will be noted in some cases which may commence in the terminal nerves and gradually ascend along the nerve trunks until the affection seriously cripples one or more of the important nerve centers and not infrequently the spinal cord. When this nervous trunk becomes involved nervous symptoms of a general nature soon manifest themselves, including those of myelitis.

In chronic cases of neuritis, pain is also a symptom but it is not of an acute character. Anæsthesia is a feature in this form of the disease as is paralysis and atrophy of muscular tissue in the affected area.

Treatment. The treatment of neuritis should be by both local and general measures. To meet the requirements in a typical case of multiple neuritis, aconite and gelsemium should find a place if the disease is observed in the acute form. Rhus-tox and matricaria can with benefit be alternated with the other remedies when pain is of a burning character with marked tenderness on pressure. An occasional dose of heroin may be given at night to insure rest, and sleep, and the bowels should be kept open with the salines.

Chronic cases due to syphilis should have phytolacca, trifolium, potassium iodide, iron, bin-iodide of mercury and arsenic. Rheumatic conditions should be treated according to the specific indications for remedies; usually bryonia, macrotys, aconite, gelsemium and the alkaline diuretics will bring decided relief if their use is persisted in. ·

Neuritis due to septic infection will usually be relieved by potent doses of echinacea and baptisia; the sulphite of soda if indicated by the broad pallid tongue coated white, or by sulphurous

or hydrochloric acid, dilute if the tongue shows red or slimy, or dark red and dry with a disposition to crack and become sore.

Where a tumor or foreign body resting against the nerve trunk excites the inflammatory state the morbid condition calls for surgical interference at once.

Local applications over the painful nerve of heat or cold often brings more or less relief, as does painting the part with the tincture of iodine once or twice a day. Fomentations to the painful area often soothes and promotes rest from pain in acute cases, while counter-irritation should be used for deep seated pain in chronic cases. Electricity should be advised in cases of threatened paralysis and rest with appropriate food should be advised in all cases either acute or chronic.

When the morbid action seems to be confined to some one of the superficial nerve trunks and no relief is obtained by the form of treatment suggested above, the nerve should be cut down upon and stretched sufficiently to overcome the contraction caused by the inflammatory action upon the nerve structure.

TRAUMATIC INJURIES TO NERVE TRUNKS

Injury to the nerve trunks inflicted by fractured bones stab wounds produced with knives or other sharp instruments, gunshot wounds and flying missiles are of common occurrence. Injuries made with cutting instruments usually divide the nerve completely, while the spicula of bone from a fracture or a bullet propelled by the explosion of gun-powder, may only bruise or simply lacerate the nerve structure. In the latter case more or less pain of an intermittent and lancinating character follows the injury, but marked changes in the severed nerve and its branches soon take place in the nature of degeneration of the nerve fibers when the trunk is completely severed, and atrophy of muscles to which the nerve and its branches were distributed soon follows; and in many cases paralysis of the parts distal to the traumatism is complete; at least for a time, when if the ends of the divided nerves are not too far separated they may become reunited in a measure through the process of repair after which functional activity will be restored in a measure.

The symptoms accompanying wounds of nerves will vary

in accordance with the nature and extent of the injury. If the nerves are simply lacerated there will be pain about the seat of injury and extending along the track of the nerve. There is usually a feeling of tingling and numbness along the course of the nerve, and not infrequently paralysis to a certain degree, of both motor and sensory filaments, are in evidence. The ends of a partially divided nerve trunk when involved in scar-tissue form the basis for a continuous irritation and pain, most distressing in its nature.

Treatment. The treatment of a divided nerve trunk is essentially by surgical methods; that is the ends should be brought together and united when possible; when this is not possible on account of a contraction within the tissues of the extremities, the ends may be lengthened by cutting a flap from the upper and lower sections of the trunk, approximating and uniting them with fine catgut using a fine curved needle in placing them. Unless the nerve is reunited soon after division the ends should be freshened before attempts at suturing are made.

Fine catgut or silk should be used to join the ends of the divided nerve, while chromicized catgut is often used as retaining sutures when needed. In placing the sutures care should be taken not to transfix the nerve so close to the end that the strand is likely to tear out when it is tied. They are usually placed about one-fourth inch from the freshened end and should not be drawn too tightly while being tied. Every precaution should be taken to prevent infection while executing the operative work and to overcome any that might be carried into the traumatism at the time the wound was inflicted. In all cases where the operation proves successful, the function of the nerve is gradually recovered, that of sensation first and motion at a later period, during which time the patient will experience a tingling sensation throughout the area to which the nerve and its branches are distributed.

The surgical implements ordinarily required for operation on the nerves are one or more sharp scalpels, sharp cutting scissors, suitable retractors, a number of small hemostats, thumb forceps, needles and needle-holder. Esmarch bandage and rubber cord, supplemented with a variety of material for ligatures

and sutures, with plenty of cotton and sterile gauze for dressings.

Following the operation the patient should be kept at rest in bed with the part immobilized to prevent force being displayed upon the reunited nerve. To aid in the return of functional activity the affected area may be occasionally massaged and electricity applied over the course of the nerve

CONTUSIONS OF NERVES

Nerve trunks, as a rule, lie so deep in the soft structures of the body as to be well protected from external injury; but occasionally some one of them suffers a contusion from a force displayed against it by a kick, blow, dislocation, or the roughened edge of a fractured bone. Its usefulness may also be crippled by compression from the presence of a tumor or foreign body resting in close proximity to the nerve, and severe strains.

The nerves most likely to injuries of this nature are those that lie near the surface and are most exposed. The ulnar and radial nerve at the wrist; the popliteal nerve behind the knee; the brachial plexus at the base of the neck and in the axilla; and the anterior tibial are thus subject to injury.

Immediately following the bruising of a nerve trunk there is a feeling of tingling, pricking, and sometimes a numbness in the soft parts supplied by the nerve or its branches. These symptoms are severe and are lasting in proportion to the extent of injury to the nerve. In cases where the nerve is severely contused temporary paralysis usually follows and degeneration of the nerve texture is not uncommon.

A neuritis often follows injury to nerve trunks which gives rise to a burning tingling pain, puffiness of the superficial tissues and tenderness on pressure.

Treatment. The treatment of contusion of a nerve trunk will be principally by local measures, although rest and the administration of such remedies as have a specific action on nerve tissue will often aid in the cure. For the burning tingling pain accompanying neuritis the following prescription will prove beneficial:

R.
```
    Spc. Tr. Aconite ................................... gtt. x
    Spc. Tr. Gelsemium ............................... gtt. xx
    Spc. Tr. Matricaria ..............................℥ j
    Aqua Dest. q. s. ...............................fl ℥ iv
```
M. Sig.—A teaspoonful every hour.

Locally to subdue tenderness and pain nothing succeeds better than topical applications of the following mixture:

R.
```
    Menthol Crystals ................................. gr. xL
    Ether ...........................................℥ j
    Spts. Camphor, q. s. .............................fl ℥ vj
```
M. Sig.—Paint over painful area or use with a spray apparatus every hour or two.

Massage and electricity will prove of much benefit in such cases as exhibit prolonged numbness and weakness of muscular structures. Counter-irritation by whatever means employed, seldom accomplishes much good; if used at all it should be limited to those cases of chronic neuritis with gradual loss of function.

TRIGGER-FINGER

The permanent contraction of one or more of the flexor tendons of a finger, causing it to assume a partially flexed state while the remaining fingers of the hand can be extended, is not an uncommon deformity with persons who suffer from rheumatism, and disease of the central nervous system. The deformity may also result from teno-synovitis and traumatism.

In many cases the finger may be straightened by exercising force to overcome the contraction, but it will at once fly back to a half flexed position as soon as the force is relaxed. On account of this characteristic it has derived the name of trigger-finger. While none of the fingers are exempt from the deformity, the little and ring fingers seem to be most frequently affected.

The direct cause of the affection seems to be a morbid thickening of the tendon or of the sheath surrounding it, a result of inflammatory action. Not infrequently a small body of cartilage will be found developing in the sheath through which the tendon glides, seriously blocking the action of the tendon. In other cases small ganglia have been found attached to the flexor tendon markedly interfering with its function.

The symptoms observed in trigger-finger are tenderness and

sulting from fracture or dislocation, and the contraction of cicatricial tissue in close proximity to the nerve.

The symptoms experienced from compression are similar to those noted in cases of neuritis, except that in compression, total loss of function is apt to ensue sooner or later, unless the compression medium is soon removed in developing tumors and in such other cases where the compression is so great that degeneration of the nerve tissue will ultimately take place.

The morbid condition of the nerve-trunk and its branches and the cause producing it will at once suggest the treatment necessary for relief and cure. If a developing tumor proves to be the pressing medium, it should be removed; a foreign body dissected out, a dislocated bone adjusted, and a fractured bone replaced in its normal position. Removing cicatricial tissue from around the trunk of an impinged nerve is essential for relief of pain, but somewhat difficult of execution.

As examples of loss of function of important nerves from pressure not uncommonly met with, the crippling of the ulnar nerve from pressure of the internal condyle of the humerus in fracture of the elbow, and the popliteal nerve and its branches of the leg, caused by dislocation backwards of the upper extremity of the tibia or fracture of the lower end of the femur, with displacement, may be cited.

BELL'S PALSY

Bell's palsy is a paralysis of the seventh cranial or facial nerve, the origin of which is in the fourth ventricle, and its several branches are distributed to the face, ear, palate and tongue. The affection is not uncommon and is due to traumatism, disease of the middle ear, and to the influence of intense cold wind against the side of the face.

The first symptom experienced at the onset of the disease, is a tingling in the lips and one side of the tongue; the side of the face affected is numb and expressionless and the corner of the mouth droops and the lids of the eye usually remain open. The face is always drawn to the well side. In pronounced cases, the tongue is badly crippled, the sense of taste destroyed,

and deglutition rendered impossible. The hearing is generally impaired and the uvula deflected to the unaffected side.

The only morbid condition with which Bell's palsy is likely to be confounded, is hemiplegia and the paralysis of the muscles of the face following that brain lesion. In the latter affection, reflex excitability remains normal, while in Bell's palsy, it is entirely lost.

The disfiguring of the features in marked cases of facial palsy is sufficient reason on the part of the patient to urge the adoption of some form of treatment for the relief and cure of the morbid state. The majority of cases of Bell's palsy will recover in a few weeks or months under proper care unless the nervous affection be due to injury; in cases of this nature, as well as in those of several month's standing without improvement, great benefit may be rendered by nerve anastomosis. The technic briefly given here, if carefully followed, will, in most cases, prove successful.

After properly cleaning the neck and side of the face with soap and water and alcohol, the facial trunk is exposed through a three-inch longitudinal incision dividing the skin, fat and fascia along the anterior border of the sternomastoid muscle; next retract the margins of the wound and check hemorrhage from bleeding points. Now clear the wound of excess fluids and if the incision has been made deep enough, the facial trunk will be observed somewhere near its exit from the stylo-mastoid foramen; with a groove director as a dissector, the trunk of the nerve is traced as far into the substance of the parotid gland as the bifurcation of the nerve. Next expose the spinal accessory nerve trunk for a half inch or more, previous to its entering the under side of the sternomastoid muscle. Both nerves are now picked up with the thumb forceps and divided at the extreme point of their exposure, after which, the divided ends are placed in opposition and secured with fine catgut. In closing the wound in the soft structures, an effort should be made to secure a little fat or fascia from adjacent tissues to surround the united ends of the nerve trunks, not alone for support, but for the protection from external influences that such tissue provides.

After clearing the wound of blood and serum the margins

are approximated and secured with the required number of cat-
gut sutures, or with a buried silk-wormgut suture; the latter
may be preferred, as it leaves no needle puncture marks in the
skin, which is a consideration, owing to the fact that the field
of operation is in that part of the neck where scars are always in
evidence.

In cases where it is not feasible to unite the trunk of the
facial nerve to that of the spinal accessory, it may be joined to
the trunk or branch of some nearby nerve, especially the hypo-
glossal; this nerve is not as easily reached as the spinal acces-
sory, but will furnish ample stimulus to the crippled branches
of the facial, once the anastomosis is accomplished.

A cure may be gradually brought about in cases of facial
palsy when due to exposure to sharp, cold winds or other like
forces producing shock to the nerve, by the local application of
stimulating lotions, moderate massage, and the use of electricity
over the dormant muscles. Tonics and stimulating remedies
taken internally, do little, if any good, other than to whet up
the appetite and improve the general health.

PART THIRTEEN

Lesions of the Brain and Spinal Cord

FISSURES, SINUSES AND CENTERS
OF THE BRAIN

It is of the utmost importance for the surgeon to have a correct knowledge of the location of the convolutions, fissures, and sinuses of the brain before attempting to execute operations upon that mass of nervous structure. Many diagnosticians have become so expert in cerebral localization, that it is possible for them to place a mark upon the surface of the scalp over the area where a tumor, abscess, or coagulum presses into the brain substance, being governed almost entirely by a knowledge of the motor and sensory functions of the surface convolutions of the cerebral mass.

The functions of the cerebellum are not so well understood as are those of the cerebrum, hence diseased conditions of this portion of the brain are not so accurately located. The dissimilarity in the shape of the skulls of human beings of the several nationalities will cause a slight deviation in the topography of the brain surface, yet these variations will not be so marked but what the brain lesion can be approached through a moderate sized opening trephined in the skull.

Before considering morbid states of the body following lesions of the brain, it will be well to study the anatomical relationship that exists between the gyri, fissures, and sinuses, on the cerebral surface. The surface markings on the accompanying cuts of the brain show, with a reasonable degree of accuracy, the location of the principal convolutions, sinuses, fissures, and motor centers and centers of some of the special

A—Fissure of Rolando.
B—Superior frontal fissure.
C—Inferior frontal fissure.
D—Parieto-occipital fissure.
E—Ear.
1—Motor area for leg.
2—Motor area for arm.
3—Center of speech.
4—Center of motion for arm and hand.
5—Middle frontal lobe.
6—Precentral fissure.
7—Broca's convolution, the cerebral center controlling speech.
8—Center governing locomotion.
9—Center of vision.
10—Superior temp. sphenoid fissure.
11—Center of hearing.
12—Motor center for fingers and wrist.
13—Cerebellum.
14—Middle temp. sphenoid convolution.

Fig. 83.—The brain—its fissures, convolutions and motor centers.

Objective Points On the Surface of the Skull.

Bregma—Located at the point of junction of the sagittal and coronal sutures.

Lamda—Located at the point of junction of sagittal and lamdoid sutures.

Obelion—Located at a point midway between the parietal formina.

Asterion—Located at the junction of the occipital, parietal and temporal bones.

Peterion—Located at the junction of the frontal, parietal, squamous, and greater wing of the sphenoid bones.

Gonion—Located at the angle of the lower jaw.

Ophryon—Middle point of the transverse supra-orbital line.

Basion—Located at the mid-point of anterior boundary of foramen magnum.

Stephanion—Ridge at intersection of coronal suture and temporal fascia.

Nasion—Located at the junction of the nasal and frontal bones.

Inion—External occipital protuberance.

Location of Cerebral Fissures and Sinuses

Median Fissure—Separates the hemispheres. Supposed to be located one-fourth of an inch to the right of the median line in right-handed individuals; and the same distance to the left in left-handed persons.

Fissure of Rolando—Separates the frontal from the parietal lobe. It commences near the longitudinal fissure and extends downward and forward to

a point a little above the horizontal limb of the fissure of Sylvius, and about one-half inch behind the ascending limb of the same fissure.

Superior Longitudinal Sinus—Extends from the foramen cæcum backward, parallel with and about one-third of an inch on either side of the median line of the skull, terminating in the torcular herophili.

Fissure of Bichat—Separates the cerebrum from the cerebellum.

That important convolutions, fissures, and motor centers might be approximately determined, Broca, after naming prominent landmarks upon the surface of the skull, established a system of lines upon which measurements are made and calculations reckoned. He first established a horizontal line, passing from the center of the alveolar process of the superior maxillary bone to the lower part of the occipital bone, the line
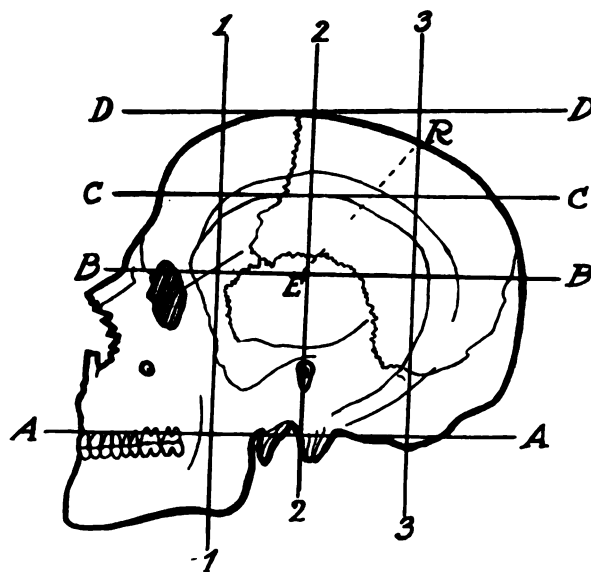
Fig. 84.—A system of lines upon which measurements can be made in the localization of various centers on the outer surface of the brain.

passing along the lower border of the condyles. (See cut A. A.). Placing the head so that this line is truly horizontal, a perpendicular one is next drawn, extending from the base line A.-A., upward, passing through the external auditory meatus; at the point where this vertical line (2-2) intersects the crown of the head, the vertex is located.

(D-D) represents an imaginary line touching the crown of the head, running parallel with the base line A-A. Upon this line we measure two inches posteriorly, from which point a second vertical line is drawn, represented by (3-3), at or near the point where this line intersects the convexity of the skull, is located the termination of the fissure of Rolando; and a line extending downward and forward, intersecting the vertical line (2-2) at E., marks the underlying course of the fissure on the outer surface of the brain.

A second line parallel with the base-line (A-A) is drawn from the external angular process of the frontal bone, backward, as shown by (B-B). Beneath this line lies a goodly part of the anterior portion of the fissure of Sylvius. A small fraction of an inch and behind the intersection of the line (B-B) and (2-2) is the inferior termination of the fissure of Rolando. This line also marks the location of Broca's lobe, the center governing speech, which is located about one inch posterior to the external angular process.

The lower end of the fissure of Sylvius is located about one and one half inches from the external angular process of the frontal bone on a line drawn from about the center of this process to the center of the occipital protuberance (inion). The trend of the cleft is backward and upward on a line drawn from the point of location of the lower end of the Sylvian fissure on the base-line just described to the parietal eminence. The vertical or anterior limb of the fissure passes upward and slightly forward.

The location of the intra-parietal fissure behind the fissure of Rolando, is of importance, marking as it does the motor area posteriorly, the motor centers for the **opposite** leg and foot being located along its upper border about its middle; the motor centers governing movements of the wrists and fingers, resting along its anterior and ascending border in the ascending parietal convolution.

It is a well established fact that destruction of any one of these centers, whether of motion or special sense, abolishes the function of the corresponding organ, while compression from whatever cause produces irritation of the organ, amounting to convulsive action in many cases and total abolition of

function, if the pressure is severe; in other words, paralysis always follows destruction of the motor centers by laceration, or marked degrees of compression. Paralysis caused by compression may be speedily relieved by removing the medium of pressure; if caused by destruction of the motor center it will remain permanent.

The usual symptoms observed in a marked case of compression following head injuries are absolute unconsciousness, may be paralysis; pupils unequally contracted or dilated; temperature about normal, may be slightly elevated; respirations usually slow, full, and stertorous; pulse generally slow and strong; seldom nausea and vomiting.

The surgeon having in mind the location of motor and sensory centers upon the surface of the brain cah approximately locate the lesion that cripples the function of distal organs and limbs.

A person suddenly or gradually developing mental aberrations, when otherwise healthy, is likely to be suffering from a developing tumor, or abscess in the anterior lobes of the brain, or there may be a coagulum or a depressed fragment of skull, a result of traumatism, pressing upon some one of the frontal convolutions. Should the lesion be a little higher up on the brain surface, near the vertex, along the top of the ascending frontal or parietal convolutions, there will be a motor disturbance of the arm, leg, hand or wrist.

Convulsive paroxysms of the tongue and muscles about the mouth will result from compression of the lower portion of the ascending frontal lobe bordering on the fissure of Sylvius on the opposite side to that on which the defect occurs. If a patient is laboring under aphasia in connection with a convulsive state of the muscles of the tongue and face, it is quite likely that the brain lesion has extended to Broca's lobule and a trephine opening the size of a quarter, in the immediate region of the centers of speech and that of the tongue will reveal the object of compression.

Many cases of brain lesion might be cited in this connection bearing out the exactness with which the morbid state may be located, but the student and others are referred to works on surgery of the brain which deal exhaustively with the subject.

In operating upon the brain to relieve cerebral lesions, care should be taken not to enter the deeper recesses of the nerve structures. Abscesses may be evacuated that have formed rather deep in the brain substance, the surgeon utilizing a groove director or a small trocar and canula to execute the work, at the same time using great care not to unnecessarily lacerate or otherwise injure the cerebral substance.

A bullet fired into the brain and finding lodgment near the center of the nervous body had better not be disturbed in attempts at removal, especially if no serious symptoms immediately follow the injury, neither should operations be attempted on the pons or medulla for the removal of foreign bodies or morbid growths, as the procedure is likely to endanger the life of the patient.

A considerable portion of the frontal convolutions may be lost through traumatism and yet the patient recover with perhaps no more lasting defect than a slight lapse of memory, and a disposition somewhat difficult to restrain.

Two cases that occurred in the author's practice, strikingly illustrate the effect of the loss of brain substance where the patient survived the injury. One, a boy of twelve years, received a compound fracture of the anterior superior portion of the cranial vault from a blow inflicted with a baseball bat. Small portions of the skull were broken loose by the compact and driven into the brain, the removal of which was followed by a considerable loss of cerebral substance. The patient regained consciousness within twenty-four hours and complained of but little pain following the injury. There was a rise of temperature of a degree or two for the first few days, attended with thirst and a somewhat blunted sensibility. There was no lack of functional action of the organs of the body after the first forty-eight hours and in two weeks the boy was up and about. During two years that he was under observation, all of the senses seemed to be normal, except, at times, he was rather dull of comprehension and the memory was slightly defective.

The other case was that of a boy of ten years, who received a compound fracture of the skull at the junction of the frontal and parietal bone, near the vertex, produced by a kick from a

horse. The concussion rendered the patient unconscious for nearly seventy hours, when, after a period of nausea and vomiting, he gradually regained his senses; several spicula of skull were removed from the brain and fully a half ounce of cerebral substance was lost through the traumatic opening. Following the reaction there was a rise of temperature for a few days, but the functions of the body were not seriously disturbed. He was rather dull of comprehension for a month or more and when questioned would reply in disconnected sentences. He gradually recovered without motor or sensory paralysis.

Treatment of traumatic injuries of the brain will vary to meet the existing condition of each individual case. If the scalp is not much lacerated in compound fractures of the cranial vault, it should be incised over the seat of the injury and reflected back, exposing the broken skull; fragments found driven into the brain should be removed and depressed portions elevated. Clots of blood, loose brain substance, and foreign matter are to be carefully removed and the wound cleared with antiseptics. If hemorrhage from a sinus follows the removal of a coagulum, it should be stayed by plugging the seeping vessel with bits of sterile gauze. Severed arterial branches are to be picked up and occluded by tortion.

The patient is kept at rest in bed and the scalp sopped with cooling lotions or cold compresses applied to keep down cerebral irritation and to control feverish states. Drainage should be provided for if the nature of the injury requires it, by placing in the lower extremity of the wound small strips of iodoform gauze.

Not much good can be expected from the administration of medicines internally to relieve brain lesions of a traumatic nature, although cerebral irritation and surgical fever usually appearing, following reaction, may be calmed by potent doses of aconite and gelsemium, veratrum and cannabis indica, and bromide of soda.

The bowels are to be kept open with the saline laxatives and the function of the kidneys kept active with stimulating diuretics. The diet should be taken in fluid form and should be both palatable and nutritious. Soups and broths, milk.

eggs, jellies, rice and cream, ice cream and plain sponge cake compose a dietary that is generally taken with a relish.

COMPRESSION OF THE BRAIN

Fracture of the tables of the skull, with depression, are common injuries. If the depression be of a marked degree, compression of the brain will result. Compression of the brain may also result from hemorrhage, a clot forming, producing pressure. Tumors and foreign bodies are frequent causes of compression; so are abscess formations, resulting from wound infection.

The symptoms accompanying the injury, generally indicate the degree of compression. In mild cases, the symptoms may not differ much from those of severe concussion. The special senses will appear more or less crippled, but not entirely abolished. The patient will remain semi-conscious, and while the power of exercising the voluntary muscles will be crippled, it will not be lost. There may be nausea and vomiting and the pupils unequal. The pulse and respiration may both be feeble.

In pronounced cases of compression, the patient remains in a state of coma, the respirations are usually slow, stertorous, and of a blowing character. The pulse is full and slow and the pupils usually contracted. One may be contracted and the other dilated. Not infrequently the urine is retained, but the bowels move involuntarily. If hemorrhage follows the injury and a clot of considerable size is formed, and presses deeply into the brain substance, paralysis of one side of the body may result.

Most of the symptoms enumerated immediately follow compression of the brain when due to the presence of a foreign body, or depression of the tables of the skull in fractured injuries. If the symptoms of compression manifest themselves some hours after the reception of the injury, the morbid state will most likely be due to hemorrhage and the formation of a clot. If a few days supervene between the reception of the injury and the more pronounced symptoms, abscess formations due to inflammatory action is likely to be the exciting cause.

Some significance is attached to the appearance of the pupil in grave cases of brain injuries by some observers. Cerebral irritation following slight injuries or effusion, usually produces a contraction of the pupil, while a fully dilated and fixed pupil denotes a more extensive injury to the brain, or the pressure of a large amount of effusion, to a great extent abolishing the functions of the cerebrum.

Treatment: It is the duty of the surgeon to resort to surgical measures as soon as symptoms of compression become manifest. This may immediately follow the receipt of the injury, depression of a portion of the skull being the usual exciting cause. The scalp over the fractured injury, if untorn, should be incised three or four inches and the margins pulled aside with retractors. If the tables of the skull are so broken that an elevator can be utilized, depressed portions of the bone are raised and removed with forceps. If the tables of the skull are markedly depressed without serious fracture, an opening through the tables of the cranium close to one side of the depressed area will have to be made with a trephine, through which the elevator is introduced and the fragments pried into place or dislodged. Before closing the wound it will be well to ascertain if a clot exists in the region of the injury and, if found, it must be removed, together with any debris resulting from the fractured injury. This completed, the edges of the scalp-wound are approximated and sutured with silk-wormgut.

Fractured injuries occurring near the base of the brain, resulting in depression or the formation of a clot, are always considered dangerous to life. Operative procedures should not be delayed after the morbid conditions have been determined. The writer once opened up the base of the skull, following a fracture, in an old man who fell from a load of hay, striking his head upon the frozen ground. Soon afterward he lapsed into unconsciousness and remained in this condition until the third day, when a large clot was removed through an opening made with a large trephine. Within a half hour after the operation he raised his hand to his head and remarked, "What pain I suffer." He soon lapsed again into an unconscious state and died twenty-four hours later from the serious brain lesion, aggra-

head resting on a sand-bag during the time, if one is to be obtained. Before proceeding further, all hemorrhage should be checked, then if the patient's condition does not contraindictate it, the operation is proceeded with; otherwise the wound should be dressed with sterile gauze and further attempts at removal of the tumor deferred for a day or two or until the patient gains a little strength. Later, if it be ascertained that the growth cannot be removed, much relief from the pressure symptoms will be noted by the removal of the portion of the skull resting over it.

After removing the required portion of the skull, should a tumor or blood-clot of any size exist, the morbid tissue will at once bulge into the open space, the dura-mater can be incised and its margins pulled to öne side if it is not adhered to the growth; in this case a portion of the enveloping membrane will have to be sacrificed. If the disturbing element be a clot of blood, it can be turned out with but little difficulty, as a rule. If the morbid state is due to a collection of pus within the tissues of the brain, palpation with the finger will determine its presence, when it should be evacuated and the cavity drained. If a tumor exists, it may be found near the surface, or buried within the brain substance an inch or more, however, its presence can be ascertained by palpation. If it lies within the brain tissue, this should be carefully separated by blunt dissection and the tumor mass outlined with a view to its successful removal.

Growths of a fibrous nature are usually encapsulated and can be turned out by blunt dissection, care being taken not to displace or destroy, to any great extent, adjacent brain tissue.

Hemorrhage following the removal of the growth is controlled either by packing the cavity with sterile gauze or by ligature, or both as the case will determine.

If drainage is provided for by placing in the cavity a small strand of gauze, its removal, as well as that of the packing material must be arranged for when closing the dura-mater and scalp.

By the expansion of the brain substance, the cavity is soon filled even with the opening in the skull, over which some operators place a silver plate to protect the brain; this is not

necessary in cases where only a small area of the tables is removed and drainage is not required.

Cystic growths will not only have to be opened and the contents evacuated, but the walls should be removed or the internal lining cauterized with pure phenic acid, applied sparingly with a cotton batting swab.

If the operation is properly done, the patient will soon exhibit signs of a return to normal conditions, unless shock, irritation, and infection bring on a fatal inflammatory state of the brain, which is not an uncommon sequence.

The head should be kept cool by applying to the scalp, every two or three hours, a solution prepared as follows:

R.
Tr. Arnica .... ℥ j
Witch Hazel .... ℥ jss
Tr. Aconite .... ℥ ij
Aqua, q. s. ....fl. O j
M. Sig.—Use topically on the scalp to control hyperpyrexia.

Internally small doses of spec. tr. aconite and gelsemium, alternated with spec. tr. echinacea, frequently repeated, will be of benefit in controlling fever and nervous irritation.

The bowels should be kept open with saline laxatives and the function of the kidneys kept active. The food should be fluid and nutritious, and rest in bed insisted upon.

CONCUSSION OF THE BRAIN

Insensibility resulting from stunning forces received upon the head, which may last from a few minutes to several hours, without any other apparent lesion, is termed concussion. There is, however, always congestion of the injured part, with effusion in severe cases. If the insensible state is of short duration, the brain simply suffered from shock, but if it continues for a day or two, there is reason to suspect extravasation of serous or sanguinolent fluids.

For convenience of description, the diagnostic symptoms are divided into three stages: The slightest form is the momentary loss of consciousness, or giddiness, feeble pulse and respiration, pallor of the face, cold moist skin, may be nausea and vom-

iting. Of not much diagnostic value is the appearance of the pupils, as they may be dilated or contracted, or unequally affected; that is, one dilated and the other contracted.

In the second form of the affection, the symptoms noted in the first are present, but in a more pronounced degree. At the reception of the injury, the patient usually drops pulseless and motionless, and may remain in this state for several minutes, respiration is feeble and irregular, and the pupils usually contracted. Reaction is much slower.

In severe cases all the above symptoms are aggravated, and prolonged. Here there may be laceration or contusion, with extensive effusion into the brain tissue. If this should result, the patient will exhibit great restlessness, will frequently give utterance to piercing screams, and there is likely to be local spasm or paralysis. This stage may result in inflammation, softening and abscess formation. The patient is usually aroused with difficulty, is irritable and impetuous; if recovery ensues, it will be slow and eventful.

Treatment consists in placing the patient in a comfortable position and maintaining the heat of the body by the aid of hot water bottles, or hot brick wrapped in cloths. Rarely, if ever, is it necessary to resort to the use of stimulants, if reaction is slow; with a feeble heart action, brandy or ammonia may be given hypodermically. If there is evidence of cerebral irritation, much benefit will be derived from sopping the head with laudanum and witch-hazel of each one ounce, water, one pint; occasionally fanning the part to coolness. As remedial measures, gelsemium, rhus tox, hellebore, and the bromide of soda should be given when symptomatically indicated. Quiet should be enjoined, and the function of the bowels and bladder looked after. The diet should consist of broths, milk, custards, and later on, meat jellies and rich soups.

PROTRUSION OF BRAIN SUBSTANCE

Hernia, or protrusion of a portion of the brain substance is occasionally encountered in general surgical practice. The bulging mass may be small in size, yet it becomes, sooner or

later, a source of constant discomfort through either irritation or infection or both.

The cause of the morbid condition is an unnatural opening in the skull, due either to a faulty development of the cranial vault or to traumatism, which is later followed by intracranial pressure.

In the course of time the exposed mass becomes tender and inflamed and bleeds readily if its external surface is irritated. Besides the protrusion is unsightly and not unfrequently painful.

The principal object in the treatment of **hernia cerebri** is to cover over and protect the exposed brain substance from external violence; to accomplish this step in the work, the protruding portion may have to be removed by excision, which should be done under strict antiseptic precautions. Following this procedure, an effort should be made to utilize a sufficient amount of the adjacent skull and scalp tissue to bridge over the chasm. In some instances, where the scalp over the tumor is intact, a celluloid plate of the required size may be placed beneath the scalp and fascia, covering the hernial mass. This is accomplished by making an incision in the scalp down to the bone to one side of the chasm, carefully dissecting up the flap sufficiently to slip the plate into position, after which, the margins of the wound are placed in position and secured with sutures of catgut. A compress of sterile gauze should next be applied and a bandage adjusted.

Preceding the operative procedure, the head should be shaved and the scalp rendered thoroughly aseptic by washing it first with soap and water followed with alcohol.

MENINGITIS

Inflammation of the meninges, the delicate membranous covering of the brain and spinal cord, occurs in two forms. leptomeningitis an inflammation of the pia and arachnoid membrane, and pachymeningitis or inflammation of the dura mater.

Traumatism is a common cause of both forms of the morbid condition, although the inflammatory conditions often result

om syphilis, rheumatism, infectious fevers, diseases of the iddle ear, necrotic conditions of the skull and diseases of the ore important organs of digestion and the circulation.

Leptomeningitis, one of the two forms of the disease is the ost frequently met with, it often appearing as an epidemic, hen it is more frequently spoken of as cerebrospinal meningitis.

The inflammatory disease may have its origin at the base the brain or at the convexity, the latter portion being fre- iently due to injuries. From the first inception of the disease, rapidly extends until the entire membrane is involved, which iually presents a thickened and congested appearance, soon llowed by an accumulation of the cerebrospinal fluid, markedly ianged in appearance, somewhat cloudy at first, later assum- g the color of pea-juice, caused by the presence of pus cells.

The invasion of the disease is usually marked by a rise of mperature, increased heat of the scalp, throbbing pain in the iad, nausea, sometimes vomiting, restlessness, and delirium. here is intolerance to light and noise; the tongue is usually ated with an ashen grey fur, except in infectious cases, when is likely to appear dark red, dry and sometimes showing a own coating. The bowels are usually bound up and the cretions of the kidneys are scant. The pupils are generally ntracted, except in cases of excessive accumulation of cerebral id, when they may be dilated, accompanied with convulsions, d spasmodic action of the muscles. Cases that are likely to ove fatal usually lapse into a state of stupor, there is muscular laxation, low muttering during periods of delirium, and paraly- i, to some degree, of the cortical nerve centers Instead of e head being retracted and rolled from side to side as noted the early stages of the disease, it is held in one position iietly, while the body nearly always assumes the dorsal posi- m

Treatment: The treatment will depend largely upon the use of the attack; when due to extension of inflammation om adjacent structures, or causes other than trauma, much iod may be accomplished from medicinal agents, intelligently escribed. At the outset, the patient should be given a bath weak salt water, rubbed dry and placed at rest in bed. The iwels should be opened with a saline cathartic and the kidneys

kept free with citrate of potash. For the fever and irritation of the cortical structure, aconite and gelsemium are usually indicated, alternated with rhus tox, when there are sudden startings during the periods of sleep, at the same time crying out sharply, and when the tongue shows the characteristic indications for the remedy. Bryonia should be substituted for the rhus, when the pulse is full and vibratile, accompanied by flushed right side of the face and head, with pain accompanying

Bromide of soda and potash are not without benefit in case marked with high fever and extreme restlessness. The remedy should be given in small doses, frequently repeated, to get the best results. Belladonna and helleborus are frequently indicated in the second stage of the disease; the first when the patient assumes a condition of hebetude, eyes dull, pupils dilated, with a tendency to coma. The latter should be thought of with the first manifestations of the collection of cerebrospinal fluid (cerebral dropsy). The prominent symptoms calling for the drug are pale features, breathing slow and deep, sleeping with the eye-lids partly open, eyes rolled upward and symptoms of paralysis developing.

With the developing symptoms of the collection of the cerebrospinal fluid, resulting from disease and traumatic injuries to the membranes, the case becomes of interest to the surgeon the former condition, when fully developed, requires opening the skull with the trephine and evacuation of the excess fluid and the establishment of drainage in suitable cases; when due to the latter cause, the wound may, with benefit, be enlarged, the fluid drained away, and such after treatment followed as the individual case will require.

The septic cases will require some potent antiseptic internally to prevent, if possible, the extension of the morbid to the contiguous structures, while the strength of the patient should be maintained with small, but frequent doses of stimulating remedies and fluid foods. Echinacea will be indicated first condition, while arsenic, phosphorus, strychnia and lime salts will supply the needed stimulation.

Inflammation of the dura mater (pachymeningitis) usually ushered in with fever, headache, throbbing pain and lessness; and the progress of the disease will depend

on the exciting cause provoking it. It makes rapid headway when due to infection, following fractured injuries. This form of meningitis is not as commonly met with as leptomeningitis. The inflammatory action is usually displayed on the inner surface of the dura and is characterized by the plastic nature of the exudate, which later becomes, to a greater or less degree, vascular in the chronic form. the vessels giving way under pressure in some cases, eventuating in more or less hemorrhage.

The symptoms following these morbid changes are mostly of a nervous character; headache, steady dull pain in the head, requiring the patient to be kept free from noise and motion.

Owing to the morbid changes taking place in the dura and the accumulation of purulent fluid, and possible hemorrhage into the subarachnoid space, the treatment, to avail any possible good will, of necessity, have to be mainly surgical.

If a collection of the purulent fluid is suspected within the subarachnoid space in either the acute or chronic form of the disease. a trephine opening should be made in the skull, large enough to evacuate the pus and to establish drainage, if the conditions require it, care being taken not to open any one of the large sinuses in the operative procedure. Should the exudate be thick and flaky or blood-clots in numbers exist, counter openings may be required to completely rid the space of the morbid matter. The results are favorable in most cases, except in those where the infection has reached important blood-vessels, producing changes that later occlude them.

The treatment of this morbid disease with serum in graduated strengths has been followed by excellent results in some cases in which it was used in the early stages of the attack. The use of the potent agent is, however, yet in the experimental stage; what the further use of it will determine, the profession will be anxious to know.

HYDROCEPHALUS

Hydrocephalus is generally understood to be an abnormal accumulation of serous fluid within the meninges of the brain. Acute hydrocephalus is a sudden inflammatory attack of the

kept free with citrate of potash. For the fever and irritation of the cortical structure, aconite and gelsemium are usually indicated, alternated with rhus tox, when there are sudden startings during the periods of sleep, at the same time crying out sharply, and when the tongue shows the characteristic indications for the remedy. Bryonia should be substituted for the rhus, when the pulse is full and vibratile, accompanied by a flushed right side of the face and head, with pain accompanying.

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The symptoms following these morbid changes are mostly of a nervous character; headache, steady dull pain in the head, requiring the patient to be kept free from noise and motion.

Owing to the morbid changes taking place in the dura and the accumulation of purulent fluid, and possible hemorrhage into the subarachnoid space, the treatment, to avail any possible good will, of necessity, have to be mainly surgical.

If a collection of the purulent fluid is suspected within the subarachnoid space in either the acute or chronic form of the disease, a trephine opening should be made in the skull, large enough to evacuate the pus and to establish drainage, if the conditions require it, care being taken not to open any one of the large sinuses in the operative procedure. Should the exudate be thick and flaky or blood-clots in numbers exist, counter openings may be required to completely rid the space of the morbid matter. The results are favorable in most cases, except in those where the infection has reached important blood-vessels, producing changes that later occlude them.

The treatment of this morbid disease with serum in graduated strengths has been followed by excellent results in some cases in which it was used in the early stages of the attack. The use of the potent agent is, however, yet in the experimental stage: what the further use of it will determine, the profession will be anxious to know.

HYDROCEPHALUS

Hydrocephalus is generally understood to be an abnormal accumulation of serous fluid within the meninges of the brain. Acute hydrocephalus is a sudden inflammatory attack of the

kept free with citrate of potash. For the fever and irritation of the cortical structure, aconite and gelsemium are usually indicated, alternated with rhus tox, when there are sudden startings during the periods of sleep, at the same time crying out sharply, and when the tongue shows the characteristic indications for the remedy. Bryonia should be substituted for the rhus, when the pulse is full and vibratile, accompanied by a flushed right side of the face and head, with pain accompanying.

Bromide of soda and potash are not without benefit in cases marked with high fever and extreme restlessness. The remedy should be given in small doses, frequently repeated, to get the best results. Belladonna and helleborus are frequently indicated in the second stage of the disease; the first when the patient assumes a condition of hebetude, eyes dull, pupils dilated, with a tendency to coma. The latter should be thought of with the first manifestations of the collection of cerebrospinal fluid (cerebral dropsy). The prominent symptoms, calling for the drug are pale features, breathing slow and deep, sleeping with the eye-lids partly open, eyes rolled upward and symptoms of paralysis developing.

With the developing symptoms of the collection of the cerebrospinal fluid, resulting from disease and traumatic injuries to the membranes, the case becomes of interest to the surgeon; the former condition, when fully developed, requires opening the skull with the trephine and evacuation of the excess fluid and the establishment of drainage in suitable cases; when due to the latter cause, the wound may, with benefit, be enlarged, the fluid drained away, and such after treatment followed as the individual case will require.

The septic cases will require some potent antiseptic internally to prevent, if possible, the extension of the morbid state to the contiguous structures, while the strength of the patient should be maintained with small, but frequent doses of stimulating remedies and fluid foods. Echinacea will be indicated in the first condition, while arsenic, phosphorus, strychnia and the lime salts will supply the needed stimulation.

Inflammation of the dura mater (pachymeningitis) is usually ushered in with fever, headache, throbbing pain and restlessness; and the progress of the disease will depend largely

on the exciting cause provoking it. It makes rapid headway when due to infection, following fractured injuries. This form of meningitis is not as commonly met with as leptomeningitis. The inflammatory action is usually displayed on the inner surface of the dura and is characterized by the plastic nature of the exudate, which later becomes, to a greater or less degree, vascular in the chronic form, the vessels giving way under pressure in some cases, eventuating in more or less hemorrhage.

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Hydrocephalus is generally understood to be an abnormal accumulation of serous fluid within the meninges of the brain. Acute hydrocephalus is a sudden inflammatory attack of the

cerebral meninges, resulting from the infection of tubercle bacilli
for this reason, the morbid state of the coverings of the brain
is known as tuberculous meningitis.

The morbid condition is quite common in childhood, especially in the primary form; later in life it appears as a secondary infection, the bacilli being transmitted from the lungs or nearby infected area.

Fig. 85.—Hydrocephalus. Circumference of head at birth,
23 inches; at 2 months, 24 inches; at 5 months, 21 inches.

The fluid accumulates more rapidly than it is absorbed and
as a result the undeveloped cranial bones are often widely
separated, presenting in many cases, an abnormally large head.
Chief among the exciting causes may be mentioned injuries,
constitutional diseases, dentition, and prolonged nervous or
emotional excitement.

Symptoms peculiar to the morbid condition, when chronic,
are weak, flabby and attenuated limbs, pale features, protruding
eyes, enlargement of the head, which is moved with great care,
and more or less of a disposition to refrain from mental and
physical exertion; while in the acute form, the child will be
sensitive to light and noise, pulse rapid and irregular, will occasionally give vent to a piercing screaming cry, pupils generally
contracted and breathing irregular; in grave cases, there will

be convulsive action of the voluntary muscles, with a retraction of the head and a gradual fall of the temperature.

Treatment: The treatment in the acute form will be the early adoption of measures to relieve the fever, restlessness and cerebral disturbance and restore normal functional action of the skin, kidneys and bowels. To accomplish the first, spc. tr. aconite, added to gelsemium, if the eyes are bright and pupils contracted, is alternated with rhus or bryonia as the symptoms may suggest. If the head is hot and the patient restless, much relief may be obtained from wetting of the scalp with the following solution:

R.
   Menthol Crystals (dissolved in Alcohol) .... gr. xx
   Tr. Opium .... ℥ ss
   Camphor Water q. s. ....fl qt. j
M. Sig.—Use locally to the scalp every half to one hour.

If nausea and vomiting be present with tongue indications of a foul stomach, an emetic of hot mustard water will promptly relieve the unpleasant situation. The bowels should be moved with enemas of turpentine, glycerine, and quite warm water, and the kidneys and skin stimulated to action by sips of hot juniper-berry tea and frequent bathing in quite warm salt water, (℥ ij to a tub half full of water). After removing the child from the bath, it should be wrapped in blankets to prevent chilling. Should the morbid state start off with a diarrhœa, all attempts to quickly check it with opiates and other astringents should be discouraged, lest the arrest of the discharges prove harmful by way of bringing on a serious comatose state, that often proves fatal.

If the patient is inclined to stupor, with dilated pupils, pale features, small frequent doses of belladonna should be alternated with minute doses of arsenic; spc. apocynum, apis, and hellebore and other remedial agents may be given when the specific indications call for them.

Iodide of potassium and chloride of mercury in small doses, given in alternation will often prove efficient in removing the accumulated cerebral fluid when other means fail, in chronic cases. Here also, small doses of iodide of arsenic will prove useful as will phosphid of zinc, iron and the elixir glycero-phosphate of lime and soda.

The food should be fluid and highly nutritious. Malted milk given hot, egg albumen on cracked ice, with a little lemon juice added, fresh beef tea, ice cream, chicken broth and custards are all nutritious and toothsome and will be taken with a relish.

In grave cases, where convulsions supervene, the inhalation of chloroform during the paroxysm will lessen the severity of the attack. In connection with any line of treatment adopted, the patient should be kept quiet and free from noise.

Surgical measures have done much to relieve the immediate distress and discomfort that are present in cases of great distension of the meninges of the brain, with the serous fluid. The operation consists of puncturing the meninges of the spinal cord or the cranium, with a small exploring needle (a large hypodermic needle will do) after the skin surface has been rendered aseptic. The point selected for the spinal puncture is the interspace between the fourth and fifth lumbar vertebræ. To make the puncture painless, the skin and subjacent tissue may be cocainized by instilling a few drops of a two per cent solution of cocain. The skin should first be punctured with the point of a bistoury to permit of the easy introduction of the needle, which is carefully forced forward and inward and slightly upward, through the soft parts until the subarachnoid space is reached; this will readily be determined by a flow of a few drops of the spinal fluid.

To facilitate the operative work, the patient should be seated upon a table with his back to the operator and the trunk bent forward, with the elbows resting on the thighs and the chin in the hands, to steady the head; the needle is entered in the punctured incision, which is made just below the tip of the spinous process of the fourth lumbar vertebræ, which is determined by a line drawn across the back on a level with the top of each iliac crest. The condition of each individual case will determine the amount of spinal fluid to be removed. Following the removal of the fluid, the wound in the skin should be sealed with a piece of zinc oxide plaster. The post operative condition of the patient will determine whether or not the operation will need to be repeated.

The cranial puncture is made near the anterior or posterior

fontanelle, between the cranial bones, following the aseptic prep-
aration of the scalp to prevent wound infection, if possible. A
marked improvement in the child's condition is immediately
noted, following the drawing off of the fluid by way of a more
regular respiration and heart action, besides a retraction of the
eye-balls.

In all cases of chronic hydrocephalus with a large collection
of serous fluid, it will be well to draw off the pent-up secretion
at the outset, before placing the patient on remedial treatment,
when this has been done, better results have followed the admin-
istration of drugs.

Numerous cases have been cured or so much relieved that
great promise can be put in surgical measures, as noted above,
when properly executed.

MENINGOCELE

Meningocele is understood to be a hernial protrusion of the
meninges of the brain through a congenital defect in the skull.
The aperture is commonly located in the occipital region, near
the median line, although the defect is often observed in the
frontal region. The protruding membrane enclosing a greater
or less amount of cerebral fluid, appears beneath the scalp, where
it feels like a bag of water to the touch. The tumor rapidly
increases in size during straining efforts at stool, while crying,
and when coughing or sneezing.

The congenital aperture is not always confined to the skull;
it is sometimes noted in the upper portion of the vertebral
column, where the tumor may show so small that a cyst or an
abscess beneath the integument might be suspected, as fluctua-
tion in most instances, is present.

The morbid development, when located in the latter location
may disappear in time and the aperture in the upper vertebræ
close through the process of repair, or it may gradually increase
in size until it assumes the size of an orange, presenting an un-
sightly appearance, besides markedly crippling the action of the
cervical muscles.

A meningocele varies in size from a tumor the size of an
English walnut to that of a child's head and the skin overlying

the growth may be thin, red, and more or less vascular. In some instances, the growth is exceedingly tense, compression of which causes marked cerebral symptoms, indicated by stupor, and sometimes nausea and vomiting.

Treatment: The treatment consists in compression, in cases of moderate size; protection by means of cotton pads, held in place with adhesive strips or bandage, where the development is large and the integument thin, after a portion of the cerebral fluid has been drawn off with an aspirating needle.

Injecting the cavity of the tumor after much of the spinal fluid has been evacuated, in cases where the development is small, and the aperture through the osseous structure is narrow, has resulted in a cure in numerous instances. The following mixture known as Morton's fluid, is used in quantities to suit the individual case:

℞.
```
    Iodine ...................................... gr. x
    Iodide Potassium ........................... ℥ ss
    Glycerine ................................. ℥ j
```
M. Sig.—Only a few drops is injected as a rule, enough to set up the necessary inflammatory action within the membranes. Not infrequently shock follows the operation.

A cure of the morbid condition has followed rupture of the protruding meninges, following this the redundant portions were cut away and the external wound closed and dressed with compress and bandage; this led to the extirpation of the sac in suitable cases after ligating the pedicle; afterward closing the external wound in the usual way.

Spontaneous rupture, in cases where the cystic tumor was of large size, has speedily terminated in death.

A hypodermic needle is of signal service in forming a diagnosis, care being taken not to plunge the needle in too deeply, that the brain substance would be injured, if present in the tumor.

CEREBRAL PALSY IN INFANTS

Infantile cerebral palsy not infrequently follows the birth of the child, the morbid state being due in most cases to hemorrhage resulting from injury to the meninges or brain sub-

stance, or to intracranial pressure at a later period. If the abnormal condition is not relieved within a reasonable time, by operative means, lasting physical ailments, such as epilepsy and imbecility, often supervene, seriously crippling the health of the patient.

Treatment: In case of hemorrhage from traumatism, clots form, which produce pressure upon important nerve centers, and the intracranial pressure is due to a small and fully developed cranium. The nature of the cause of the cerebral disturbance will at once suggest the necessary treatment to afford complete or partial relief. If the location of a hemorrhagic clot can be determined the skull should be opened by trephine or otherwise and the plug removed with a small scoop or dressing forcep, and, in the case of a contracted and firmly developed cranium, sections of the same should be removed from before backward, near its convexity, with bone gouges or craniotomy saw, giving due heed to the location and causes of the sinuses. If necessary to give greater expansion to the brain oblique sections of the skull may be removed, extending from the one first made.

The incision made in the scalp to form the flaps should extend to the skull, and be so directed as to avoid, in so far as possible, important nerves and blood-vessels. Previous to commencing the operative work the scalp should be shaved and thoroughly cleansed with soap and water, followed with sterile alcohol.   ,

After the removal of the necessary sections of the skull the flaps should be readjusted and secured by interrupted sutures of catgut. Over the external wound antiseptic powder should be dusted, and then covered in with sterile dressings.

The operation requires that the patient be given a general anæsthetic, but only in such quantities as will merely blunt sensibility. Other precautions necessary to observe are the avoidance of shock by keeping the little patient warm and speedily executing the work.

TREPHINING

Morbid conditions of the brain and its envelopes and fractured injuries often require the removal of a circular disc of

the skull with the trephine for diagnostic and operative purposes. If upon examination the nature of the injury requires removal of a considerable portion of the skull, several openings may be made with the trephine and the intervening portions cut away with forceps.

The trephine has a circular cutting edge with saw-like teeth and a handle like a gimlet. There is a sharp center pin that can be raised or lowered that is so adjusted at the commencement of the operation that the point holds the saw in position until it cuts a groove of sufficient depth to hold it steady. The center-pin is then loosened and drawn up into the shaft of the trephine which is made to complete the work by rotating the instrument backward and forward by force applied to the handle; should the teeth of the instrument become clogged with bone dust the instrument is to be removed and the groove and its cutting edge freed with a small bristle brush that usually goes with a trephining outfit.

While executing this work care should be taken not to force the cutting edge of the instrument through the meninges of the brain after cutting through the outer table of the skull. As soon as the circular piece of bone is loosened it is removed with an elevator and forceps, the opening cleared of debris, the condition of the brain and its coverings determined if possible, after which, if the operation does not have to be extended, the disc of bone is replaced after all hemorrhage has been stopped; if there is any, provision for drainage should be provided for by the placing of two or more short pieces of medium-sized catgut strands in the wound and the margins of the scalp approximated and secured with catgut sutures. The wound is then dressed with sterile gauze that is held in place by bandaging.

The instruments required to execute the work will be a scalpel, a number of small hemostats, a small bone elevator, two or three small probes, a trephine outfit, bone cutting forceps, needles and needle-holder, sterile silk and catgut with plenty of gauze sponges and other dressings.

The operative work is done while the patient is under chloroform anæsthesia, after he has been prepared in the usual way for the work.

OSTEOPLASTIC CRANIOTOMY

Craniotomy means the opening of the cranial cavity for the removal of tumors, evacuation of cysts, and the breaking up of superficial adhesions. Formerly no greater portion of the skull was removed for the purpose of exploration and operation upon new growths than was removed by a large sized trephine; of late years operators have been more bold and have laid bare quite large surfaces of the brain by cutting loose and turning back a disc of bone of sufficient size to facilitate the operative work on the nerve substance. The scalp-flap is kept intact with the reflected disc and is not severed at its base.

Preparatory for the operative work the head should be thoroughly shaved and a rubber cord adjusted around it to prevent hemorrhage after incising the scalp. The bony disc and the scalp covering it should be so fashioned as to preserve the blood vessels extending into it, to afford the necessary nourishment to promote a rapid healing of the incisions.

After administering a general anæsthetic the patient should be placed in a position most favorable for the performance of the surgical work with the head elevated upon a salt-bag or block of wood covered with padding. The shape of the flap, that it is proposed to dissect up, is next marked out upon the surface with a pencil or the handle of the scalpel and the incision should extend to the bone which is bared just sufficient to permit of its being cut through either with the Powell electric saw, the Gigli

Fig. 86.—Gigli saw, useful in osteoplastic operations.

saw, bone forceps, or divided with Hartley's gouges. If the Gigli saw is used through small trephine openings made along the line of incision, the operator should be cautious at all times not to tear the dura or lacerate the cortical substance of the brain. This is best accomplished by separating the dura from the under surface of the skull through the trephine openings with a small flexible spatula, then inserting a grooved director along the line of incision upon which the saw is passed and made

to sever the intervening bony spaces by a forward and backward motion. After the disc of bone is divided on all sides except its narrow base it is raised with an elevator sufficiently to cause a fracture through this portion of the bone. The bony disc with its covering of scalp is then turned down exposing the diseased area of the brain surface; after executing the necessary work the bony flap is turned back into place, the margins of the scalp wound held in apposition with strips of Z. O. plaster or sutures of silk-wormgut. With no complications, the external wound will be very securely united in two weeks, and bony union will have taken place in another ten to twenty days.

It may be well to remark in this connection that after turning back the bony disc the dura is carefully raised on a grooved director and severed by a curved incision to conform to the margins of the opening in the skull. When closing use fine catgut by a continuous suture.

If the operation is done to evacuate an abscess it will be necessary to provide for drainage by inserting through a small stab wound, a little below the primary incision, a piece of wick enclosed in a layer of rubber tissue.

In extreme cases of compression of the brain both sides of the skull may be operated on and even the cerebellum may, with safety, be approached through a T or cross-bow incision in the soft parts over the base of the skull, and the base of the brain exposed through arched discs cut from the occipital bone of sufficient size to execute the work on the brain for which the skull was opened.

The external wounds in these cases are dressed with sterile gauze and cotton compresses which is held in place with a few turns of a spiral bandage. The drainage medium should be removed the second or third day and redressings done every fourth day or oftener if the nature of the wound requires it. To accomplish good results in cranial operations the technic should be faultless in every step taken.

CRANIECTOMY

The removal of strips of the cranial bones by surgical measures is frequently resorted to, to afford relief to a com-

pressed brain, when due to failure of the skull to expand as the brain develops. The contracted skull is solely due to the early closure of the coronal and sagittal sutures in early life. As a result of the intracranial pressure, the child develops a mentality often sadly at fault. The mind is weak and the imbecility increases as age advances.

The strips of skull removed are generally taken on either side of the sagittal suture and vary in width to meet the requirements in any given case. The operation is known as **linear craniectomy** and is executed as follows: The head is shaved and the scalp incised from the hair-line in front, backward to the occipital protuberance, a little to one side and parallel with the sagittal suture. To facilitate retraction of the flaps, a short, supplementary incision should be made downward and outward at either end of the longitudinal incision. In reflecting back the scalp flaps, care should be taken not to include the pericranium. As a rule the flaps will remain retracted, once they are turned down over the side of the head, if they do not, traction loops of silk should be placed in the margin of the flap and held by an assistant. Next remove a button of bone with a trephine, near the center of the area that is later removed with Powell's electric saw, bone-cutting forceps, or chisel and mallet. If the saw is used for this purpose, it is set to cut merely through the thickness of the skull, which is determined by measurement through the trephine opening. It will be necessary to previously separate the dura from that portion of the skull to be removed, with a narrow, flexible spatula, which is introduced through the opening made with the trephine. If a Powell's saw is not at hand, bone-cutting forceps should be utilized for the purpose as removing the section of bone with chisel and mallet always severely jars the brain substance.

In cases where the removal of the longitudinal sections does not afford sufficient room for the expansion of the brain, supplementary sections should be made, extending downward along the side of the head at an oblique angle, to the first section made.

In the execution of this work care should be taken not to open the large sinuses, as great loss of blood will follow the accident. Hemorrhage from small apertures in the divided

skull may be checked by plugging them with short pieces of catgut or by pressure with a pledget of sterile gauze, wet with adrenalin chloride solution, or wrung out of boiling water. If the hemorrhage is severe, the operation may have to be suspended.

Complications likely to follow this operation and which the surgeon should anticipate, are meningitis, shock and pyæmia. Individuals under ten years of age should not be subjected to this operation.

After the flaps have been replaced, following the removal of the necessary sections of the skull, they should be held in apposition with several strips of zinc oxide plaster and a dressing of sterile gauze applied. If all goes well, the external wound will be healed in ten days, but the benefit to the mentality of the patient, if any, will be gradual.

Before incising the scalp, a rubber band should be adjusted around the head below the extremities of the incision to prevent excessive hemorraghic losses.

INJURIES OF THE SPINAL CORD

The spinal cord is well protected, situated as it is in the vertebral canal surrounded by bony structures, yet it suffers injuries from external forces which may or may not fracture or cause dislocation of the bones surrounding it.

Contusions, Crushing Injuries.

Injuries of this character are generally due to kicks and blows, and other forms of external violence directed against the vertebræ with sufficient force to fracture them, forcing spiculæ of the bones into the cord, or otherwise crippling it. The displacement that takes place between the osseous fragments may not always rupture the enveloping membranes yet portions of the cord may be reduced to a pulp followed by hemorrhage and paralysis of certain groups of muscles that are dependent upon the energy of nerves involved in the injured area

The paralysis when present is generally due to extravasation of blood within a limited area of the nervous tissue, which becomes gradually manifest after the injury. Pains extending

down the back in the lower extremities with hyperæsthesia are complained of in some cases and anæsthesia of the feet and legs in others. Severe injuries to the lumbar and dorsal portion of the cord are very apt to be followed by paralysis of the bladder and bowels with retention of urine at first, perhaps, but later giving way to incontinence. Natural movements from the bowels cannot be obtained immediately following the injury, but after a time the patient may have control over this function.

Various other symptoms are likely to follow this form of injury, such as meningitis, reflex irritations, cystitis, muscular atrophy, priapism, respiratory and cardiac disturbances and bedsores from long confinement to the bed.

Treatment. The line of treatment to be adopted will depend upon whether or not the injury to the cord is due to fracture, dislocation or compression; if not due to these causes the most that can be done is to keep the system toned up and look after the functions of the kidneys and bowels. If the injury to the cord is not extensive and the hemorrhage is limited, much benefit may follow the administration of small doses of arsenate and iodide of iron, phosphid of zinc, and nitrate of strychnia, taken in alternation. These remedies will aid in the absorption of extravasated fluids and strengthen the patient.

Fractured injuries may require trephining, that spiculæ of bone may be removed and depressed fragments elevated from against the cord. Complications must be met with as they arise.

The patient should be kept at rest on a hair mattress or rubber air cushion bed and nourished with rich soups, broths, custards, milk, jellies, and the juices of fruits.

Concussion of the Cord.

Concussion of the spinal cord is generally due to the same causes that produce contusions. The morbid state is distinguished from contusions of the cord by the crippled condition being more general in character and the comparatively short time that elapses before recovery takes place. Hyperemia may follow the temporary injury, but inflammation does not unless the cord suffers a contusion at the same time; in the latter case a degeneration of the substance not infrequently follows.

The symptoms accompanying concussion of the cord are

mainly those of shock and this is observed in a greater or less degree according to the extent of the force applied. Nausea and vomiting often occur and are considered favorable symptoms. The pulse is generally accelerated and irregular and the temperature is at first subnormal, but later may rise a degree or two above normal and continue for a few days; the bowels are often bound and the function of the kidneys and bladder interfered with; if the latter is marked the patient often becomes restless and sleepless. While shock is present the patient should be kept quiet in bed and warmth applied externally and stimulants administered internally or by hypodermic.

Treatment. Nerve sedatives are indicated in most cases to insure sleep, especially at night and in this connection the quieting effect of gelsemium, passiflora and the bromides should be considered, with chloral added if the case proves exceptionally restless or small doses of heroin given hypodermically if the restless condition is associated with pain. During the period of convalescence mild tonic agents will be indicated together with a good nourishing diet, with outdoor exercise when the patient is able to take it.

Wounds of the Cord.

The cord is subject to traumatic injuries inflicted with a knife, fork, sword or bullet, and the symptoms following will depend upon the portion of the cord injured and the extent of the traumatism. One of the most serious conditions following wounds of the cord is hemorrhage, which occurs within the enveloping membranes or in the substances of the cord itself. More or less inflammatory action nearly always follows the injury, and if severe, degeneration often supervenes. If the wound involves only one-half of the tranverse area of the cord, hemiplegia soon becomes manifest. If the lesion is located in the cervical region and is unilateral, the arm and leg on the afflicted side are paralysed, the leg only being crippled, when the lesion occurs in the dorsal region, giving rise to the morbid condition, known as hemiparaplegia. Motor paralysis in greater or less degree always follows in the lower limb in the latter condition, while the limb on the opposite side from the injury to the cord is in a complete state of anæsthesia.

Besides the symptoms recounted above, there is very often vaso-motor disturbance, sufficiently severe to cause a temperature of one or two degrees and an increased pulse rate. If the patient is confined to his bed for a long period of time and bed-sores occur, they are usually found on the side that is paralysed.

Not infrequently the osseous structure surrounding the cord suffers injury at the same time the cord is wounded; this is very likely to happen in gun-shot wounds, when the processes of bone often become splintered, some of the spiculae often being driven into the substance of the cord, complicating the wound made by the bullet, and making it all the more possible for inflammation to follow the injury. There is less likelihood of active hemorrhage following gun-shot wounds of the cord, but softening or degeneration of the soft structures is more apt to occur, following this form of injury, than from incised or punctured wounds. Hemorrhage beneath the covering of the cord is less serious than when it takes place in the substance of that organ; the latter condition is always followed by a greater or less degree of paralysis, that is likely to remain permanent.

Recovery from wounds of the cord may take place in part, but restoration of function depends, of course, upon the location and extent of the injury.

Treatment: At the outset, the patient should be kept at rest in bed upon a hair mattress. During the inflammatory state, following the injury, cold applications should be applied to the spine over the traumatic area. Later, after the acute symptoms have passed away, the patient should be put upon restoratives, and such other remedial and hygienic measures adopted as the nature of the case demands. Occasional periods of severe pain and distress that will not yield to cold and other topical applications, will require an occasional hypodermic dose of heroin or morphia and atropia to give rest and promote sleep, care being taken, however, not to carry the use of the drug to extremes that the habit may be formed. Retention of urine will demand catheterization and sluggish bowel action will require an occasional dose of some efficient laxative agent and in connection, the lower bowel should be flushed every third day with glycerine and warm water, one or two ounces of the former to a quart of the latter. The diet should be mostly fluid and espec-

ially nourishing. Complications must be met with as they arise.

Shattered or splintered vertebræ, with depression, will require surgical interference to relieve the morbid state.

SPINA BIFIDA—CLEFT SPINE

Not a very uncommon malformation met with in the early existence of the infant, is that of cleft spine, or spina bifida.

The defect is an abnormal opening in the vertebral column and may occur at any point of its entirety; however, it is most commonly met with in the dorsal and lumbo-sacral region. The congenital cleft will vary from a very small opening, to the entire absence of the transverse processes of several vertebræ. It is characterized by a protuberance situated over the vertebral defect, which is composed of the meningeal sac, covered with fascia and integument.

The meningeal sac usually contains subarachnoid fluid, although it may contain serum and the trunk of semi-dormant spinal nerves.

In many instances, and especially where the protrusion is of considerable size, the overlying fascia and skin are very thin, tense, white and almost translucent.

The sensation imparted to the fingers under percussion, is that of a fluctuating mass. Little, if any pain is inflicted during the manipulation. As a rule, the meningeal protrusion projects backwards and in the median line, although instances are not wanting where, from deficiency of the vertebral bodies, the tumor protruded anteriorly.

The victim of spina bifida may or may not suffer from constitutional symptoms; it depends entirely on how much the spinal cord is involved. In aggravated cases, paralysis of the bladder, bowels, and lower extremities may be met with, likewise a deficiency of the abdominal walls, permitting hernia of the bladder. The size of the spinal protrusion may be augmented by position or lessened by pressure. When the latter is resorted to, a protrusion of the eye-balls takes place, much the same as is observed in a pronounced case of hydrocephalus, with great intracranial serum pressure. This condition can be demonstrated

better when the spinal protrusion is located in the cervical and upper dorsal region and is more pronounced where the spinal cleft is very large Then, too, it is well to bear in mind the fact that the cord and spinal nerves are seldom fourld within the sac when located in the lumbar region; while the reverse is the case, when it is found in the cervical and upper dorsal region.

A surgeon called in to confirm a diagnosis of suspected spina bifida, especially of small size, will have to differentiate
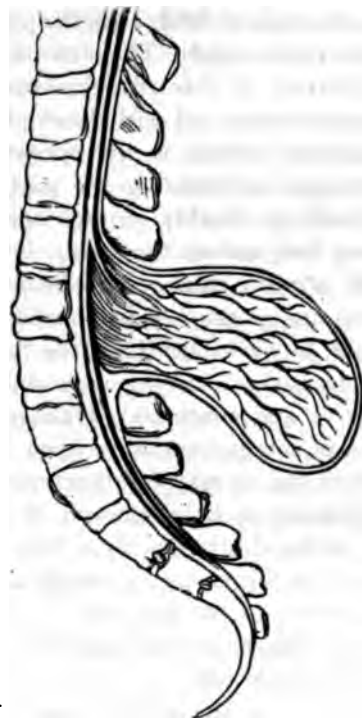
Fig. 87.—Spina bifida in the lumbar region. (*Howe.*)

between cysts and fatty tumors, that may occupy the median line of the back. These, in a sense, simulate the protrusion of the sac of serous fluid through the congenital spinal cleft. It will be well to note that the former can not be reduced by change of position or digital compression, while the latter would most likely be modified by resorting to the same test, and augmented, perhaps, when the patient is crying.

Treatment: As to treatment, little benefit can be hoped for

in these cases, from remedial or mechanical measures. The tendency of the more pronounced cases is toward an early dissolution. However, modern surgical methods have given a large percentage of cures, and, while in many cases operative procedures may seem hazardous, yet they give the only hope for possible relief from premature death.

There are two great dangers from operative procedures for the relief and cure of spina bifida; hemorrhage and shock resulting from loss of cerebrospinal fluid; also, the possible danger from sepsis must not be overlooked. Then too, the age and feeble condition of the victims of this trouble must be considered. They are usually very young and withal not physically vigorous.

Briefly, the modern technic in the operative procedure follows: After thoroughly asepticizing the parts involved, an incision is carefully made, preferably on one side of the tumor, instead of the median line, unless the tumor is of small size and the integument of normal thickness. As a usual thing, the overlying structures are so thinned by pressure and so insufficiently nourished that, however skillfully the flaps may be united and antiseptically dressed, sloughing may ensue at some point, causing an exhaustive and continuous leakage of spinal fluid.

After the flaps of integument have been carefully dissected back from the serous sac, it may be punctured with a small aspirating needle, allowing such an amount of the spinal fluid to escape as the case in hand may justify. This being done, if the tumor is of medium or large size, an exploratory opening may be made and the interior of the sac inspected. If it contains no spinal nerves of importance, and the pedicle is moderate in size, it is securely ligated with silk.

Should the opening in the spinal canal be a long, slit-like aperture, and the neck of the sac of a similar shape, the pedicle will have to be closed by interrupted silk sutures and the redundant tissue cut away.

Should the spina bifida be located in the lower part of the cord and of considerable size, the sac is likely to contain important nerves, supplying the pelvic organs and these must not be cut away. The opening is sufficiently large to permit of the replacing of the nerves well within the spinal canal previous to suturing the opening in the sac.

Often hydrocephalus complicates a case of spina bifida. In these cases it is best to postpone operative interference, except in cases where from extreme thinness of the sac walls, rupture is likely to take place. To conserve the body heat, while operating, it will be well to wrap the body and limbs in cotton, secured by bandages. The child should be fastened face downward on the table or board, to prevent undue movements during the progress of the operative work. In those cases of lumbo-sacral protrusion in a feeble child, in order to prevent too great a loss of cerebro-spinal fluid, it will be well to elevate the lower extremities while operating.

The operative work must be speedily executed to prevent shock. All bleeding vessels should be clamped as they are severed, except, perhaps, those liable to lose considerable blood; these should have a ligature of silk thrown around them and tied before severing. Silk is to be used in preference to catgut in this work, because of the slowness of the healing process.

In dealing with the sac, under no circumstances, should any important nerve be cut away, that may be found therein. It is possible to determine this point by the application of electricty. There is often some difficulty met with in the after treatment of lumbar cases in young children, on account of the nearness of the operative field to parts liable to be soiled by feces and urine. To avoid infection from these sources, the dressings must be small and sealed over with collodion, or covered with rubber tissue, the edges of which can be secured to the skin by adhesive plaster.

The after care of the child is of much importance. It must be made to lie face downward, being secured in this position by pinning its clothing to the bed covers, or portable frame, on which it may be carried about. Absorbent cotton pads should be applied to the perineum to absorb fecal and urinary discharges, and should be changed as soon as soiled.

LAMINECTOMY

Laminectomy is the opening of the spinal canal by surgical measures, for the purpose of aiding diagnosis in injuries to the

spine, such as follow dislocations, fractures and gun-shot wounds; also for the removal of morbid growths.

Before attempting the operation, the surgeon should acquaint himself with the anatomical points of the vertebræ that each step of the operation may be thoroughly understood.

After the patient has been prepared for the operation in the usual way he should be anæsthetized and placed on the operating table, turned well on his side, or face downward. A linear incision six to eight inches in length should next be made in the median line over the spinous processes, dividing the soft structures down to the lamina on either side, after which the margins of the wound should be held apart with blunt retractors. All bleeding points should be picked up and secured with a ligature. As many of the spines and laminæ are then cut away with bone cutting forceps as the nature of the operation will require. The laminæ may be severed near the transverse processes but no farther back to save the crippling of the spinal muscles, some of which are attached to the transverse process. Care during this part of the operative work should be exercised so as not to wound the dura, which, if need be, may be opened now by a median incision that later should be closed with a catgut suture by a continuous stitch.

The external wound should next be cleared of blood and other fluids and closed with deep stitches of silk-wormgut sutures provision being made for drainage, if needed, in the lower angle of the wound. An antiseptic gauze dressing is next applied and over this a plaster jacket should be snugly adjusted, the patient keeping quiet in the recumbent position while the corset is hardening. The patient should keep his bed for a month or more or until the traumatism has healed and the muscles regained something of their normal strength. Most of these cases require the wearing of a supporting brace for a long period of time following the operation.

LUMBAR PUNCTURE

Intracranial and intraspinal pressure not infrequently require lumbar puncture to draw off a portion of the accumulating spinal fluid to give at least temporary relief. The procedure is

often resorted to also for diagnostic purposes in obscure brain and spinal cord lesions. To execute the work properly it will be necessary to have a sharp pointed bistoury, a suitable-sized aspirating needle, sterile gauze, sponges and zinc oxide plaster.

After the point has been selected at which the puncture is to be made the surrounding parts are rendered thoroughly aseptic by the usual methods and the immediate site of the puncture rendered anæsthetic by the hypodermic use of a four per cent solution of cocaine. The point of puncture usually selected is the open space between the laminæ of the fourth and fifth vertebra. A punctured incision is made with the bistoury about a half inch to the left of the center of the spine through which the aspirating needle is thrust inward and obliquely upward until the dura is entered, care being taken at this point not to injure the cord. Cerebrospinal fluid will escape from the needle as soon as the latter has punctured the dura. After the purpose has been accomplished for which the operation was done, the needle should be withdrawn and the punctured wound closed with oxide of zinc plaster.

MICROCEPHALUS

Microcephalus is a term that is applied to the complete ossification of the child's head while yet in utero or immediately after birth.

A child born with this unnatural condition of the cranium, will, sooner or later, develop symptoms of deficient intellect, which in some cases borders close to the line of idiocy.

No treatment other than surgical measures will avail anything of importance along the line of relief of this rather uncommon condition of the skull.

Treatment. To relieve the compression of the brain, a linear craniotomy should be done. This is executed by making a longitudinal incision from the occipital bone to the hair line in front, about one inch to one side of the sagittal suture; the flaps are then dissected back, baring the skull, which is then trephined forward or back and a groove in the vault then cut with rongeur forceps to the extent of the incision in the scalp, if necessary;

following this, the wound is cleared of debris and the margins of the scalp next approximated and fixed with catgut sutures, all hemorrhage is then controlled by ligating or twisting the ends of bleeding vessels that the wound may not have to be re-opened once it is closed.

In a few months, the length of time depending upon the physical and mental condition of the patient, the opposite side of the cranium should be opened in a similar manner, the work being done under strict antiseptic precautions. Some operators prefer silk-wormgut to close the wound in the scalp, to catgut, although the latter when chromicized will fill every purpose.

To execute the work the operator should have at hand a scalpel, retractors, trephine, rongeur forceps, several hemostats, needles, scissors, and needle-holder, besides gauze for dressings, and bandages two inches in width.

FOCAL EPILEPSY

Epileptic siezures invariably involving certain groups of muscles that do not vary much in the order of their progress and in which the morbid action can be traced to some lesion of the motor region of the cortex of the brain are denominated **focal epilepsy.** The cause of the attacks is due to an irritation of a certain area of brain substance which may be the result of trauma, abscess, the presence of a tumor, spicule of bone or some foreign body.

The seizures may be frequent or far between and they always begin in the same group of muscles and pursue the same general course during the attack.

Treatment. The treatment of this morbid condition consists in removing the exciting cause whenever this is possible through operative procedures. The skull is trephined and depressed portions elevated and spicula removed if any are found as well as any foreign bodies that may be found resting near the brain surface. Portions of the cranium may be cut away that collections of purulent fluid may be reached and evacuated, and tumors removed when feasible. Following proper post-operative treatment the epileptic seizures generally cease at once and the general physical condition of the patient becomes much improved.

PART FOURTEEN

Lesions of the Head, Face and Neck, Nose and Throat

CONTUSIONS OF THE FACE

Contusions of the face are due to external violence displayed upon the soft tissues. Following the injury, the tissues swell and often become œdematous from effusion of serum into the injured area. If the violence is severe enough to cause subcutaneous hemorrhage, ecchymotic spots will soon appear upon the surface of the skin, which is given the common name of "black-eye," when it occurs around the eye.

The symptoms accompanying injuries of this nature are soreness and stiffness of the parts involved, with marked puffiness. Pain is seldom a feature, but the discoloration is objected to by the patient.

Treatment: To remove the swelling and discoloration of the injured parts, topical applications should be made of evaporating and cooling lotions. Alcohol and witch-hazel, equal parts, constitutes an efficient lotion for this purpose, as does ice water applied on small gauze pads. Ten grains of menthol, dissolved in two or three ounces of alcohol, will also prove effective in dissipating puffy inflammatory states, but cannot be used about the eyes. Prof. Howe advised the application of a piece of raw beef to discolored areas to hasten the absorption of the effused sanguineous fluid, but the medium has really but little virtue in that direction.

CONTUSIONS OF THE SCALP

Contusions of the scalp are of common occurrence, but they are often of minor importance. If blood vessels beneath

the scalp are lacerated, a hematoma may soon form, necessitating incising the scalp and turning the clot out, afterwards packing the wound with pledgets of gauze to check oozing of blood, if it still persists. If this operation is not done, the clot may break down into pus, dissecting the soft structure from the skull, eventuating in an abscess of a considerable size. During the time that such an abscess is forming, there is a throbbing sensation in the area affected, with more or less œdema and fluctuation on pressure, later on.

Scalp wounds of minor degree will do well under the soothing and cleansing effect of the alkaline solution, used as a topical application, several times a day, the patient being kept at rest during the time of such treatment.

RANULA—SALIVARY CYST

An obstruction of the opening of one of the salivary ducts gives rise to a small oval cystic tumor, usually situated beneath the tongue. One or more may exist at the same time, giving rise to no special symptoms outside of a certain degree of stiffness of the tongue experienced in talking.

In appearance the cystic growth is smooth and rounded and is soft and fluctuating to the sense of touch. It may be translucent or have a clear bluish cast. Its contents is usually a clear, jelly-like fluid resembling the white of egg.

The cause of the obstruction in most cases is the imbedding of a calculus in the mouth of a duct, usually Wharton's; not infrequently, phosphatic concretions are found within the cyst, varying in size from a wheat kernel to that of a cherry stone.

Treatment: A cure of the morbid growth is effected either by incision or excision under cocaine anæsthesia. After incision, the mouth of the duct should be sought for the obstruction. If one exists, its removal and the application of pure phenic acid to the interior of the cystic walls will hasten a cure. If the growth returns, the entire mass should be dissected out and the wound allowed to granulate shut. During the period of recovery, the mouth should be rinsed several times a day with

antiseptic washes, of which the alkaline solution reduced in strength is preferred.

The instruments required to execute the operative work will be scissors, scalpel, dressing forceps, hemostats, mouth-gag, needles and needle holder.

PAROTID GLAND

The parotid gland, situated on the side of the face in front and beneath the external ear, is subject to inflammatory diseases and tumors of various kinds. The anatomy of the glandular structure, and its relative position to adjacent structures should be well understood before operations are attempted upon the secretory organ.

Parotitis or mumps is a common affection of the gland and is inflammatory in nature. The prevailing symptoms are fever, thirst, headache, painful deglutition, local swelling and tenderness on pressure, speech modified, severe pain during mastication, with a tendency to a metastasis of the disease.

Fig. 88.—Tumor of the parotid gland. (*Howe.*)

A fistula of Stenson's duct is not uncommonly met with and is due to traumatism or obstruction of the salivary tube. While forming there is heat and pain in the region of the tube with tenderness on pressure. Following ulceration and rupture of the duct, which may take place externally, or upon the internal surface of the cheek, there will be a discharge of pus mixed with salivary fluid, which will be increased in efforts at chewing.

Tumors of the parotid gland may be benign or malignant; in the former case it is either due to some previous inflammatory diesase or morbid cell growth within the gland. One distinguishing feature of the benign growth is the unusual freedom with which the skin can be moved over the growth. In cases of malignant growth the contraction of tissue prevents free movements of the jaw and the integument over the tumor and inferior maxillary is contracted and seemingly fixed to the tissues beneath. It is stated by surgeons of experience that malignant disease is limited to one side and that the gland is not the primary seat of the affection, other parts of the system having been previously affected with a similar disease.

The symptoms accompanying benign tumors of the parotid gland are not usually severe in character; more or less local swelling is noted in the region of the gland with perhaps some tenderness on pressure; pain when present is generally due to pressure. Pain of a sharp lancinating character with stiffness of the lower jaw are features of malignancy and are associated with a contracted and fixed overlying integument, local swelling and marked tenderness on pressure. Large cavities are sometimes formed within the glandular structure due to cystic degeneration, several small cysts developing in close proximity to each other and finally coalescing, forming larger cystic development.

Treatment. The treatment of parotitis and other inflammatory conditions of the gland will be by both local and general measures.

In the early stages of the disease teaspoonful doses of the following mixture will meet the requirements in most cases:

R.
Spc. Tr. Aconite .... gtt. x
Spc. Tr. Phytolacca .... ℥ ss
Aqua Menth. pip, q. s. ....fl ℥ iv
M. Sig.—A teaspoonful every hour.

The above mixture may be alternated with such other medicinal agents as may be specifically indicated, usually belladonna for sluggish circulation, macrotys for metastatic conditions and the lime salts in cases threatened with suppuration. The bowels should be kept open with the saline laxatives and the action of the skin and kidneys kept normal; the patient should be kept quiet and in bed if necessary.

The diet should be taken in fluid form and composed mostly of milk, broths, malted milk, custards and soft boiled eggs.

As a local application at the outset of the disease equal parts of veratrum viride, belladonna, and phytolacca meets every requirement The mixture should be painted over the surface of the gland three or four times a day, covering the region with cotton. The above mixture should be painted over the breasts and testicles in cases where metastasis to these organs occurs and in connection these glands can be bandaged or strapped with adhesive plaster to-advantage. If suppuration is likely to occur in the parotid gland the process may be hastened by the use of poultices or fomentations.

Abscess formations should be opened as soon as it can be determined that pockets of pus exist within the gland. The cavity should be cleansed of purulency with antiseptic washes and then dressed antiseptically.

Cystic tumors are either dissected out or incised, the contents evacuated and the cavity temporarily packed with strips of sterile gauze.

In the treatment of simple growths of the gland, efforts have been made to stay their development by painting the surface with tincture of iodine and the internal administration of potassium iodide in small but gradually increasing doses, until its full effect is obtained, but with varying degrees of success; in the early stages the development of the growth has been favorably modified through the influence of these medicinal agents, but they accomplish no good after the tumor has attained a considerable size. The treatment to be relied on in such cases is that of excision with a partial or entire loss of the gland. In making the incision for enucleation of the growth, which will of necessity sacrifice a portion of the gland, due care should be taken not to wound Stenson's duct or the important vessels and nerves run-

ning through the glandular structure. After the external incision is made over the tumor dividing skin, fat, and fascia, the flaps are reflected back exposing the growth which is seized with tenaculum forceps upon which the necessary traction is made. The glandular structure is separated from the tumor mass by blunt dissection, snipping with scissors tough bands of fascia that may tightly anchor the morbid growth to the surrounding tissue. Divided vessels should be picked up with hemostats which are left in place until the tumor is removed, then tied with catgut or silk. The wound is cleansed with sterile gauze sponges after which the flaps should be united, with drainage provided for if necessary and antiseptic dressing applied.

The removal of the entire gland when it becomes enlarged by the presence of growths within its structure is an operation fraught with considerable danger, on account of the position it occupies deep in the neck and the probable injury to the large blood-vessels that ramify throughout its structure.

To properly execute the work the patient is placed on the table with the head turned to the opposite side and resting on a sand-bag. An incision is made with a scalpel over the most prominent part of the tumor which may be intersected by another over the center of the growth if it is of large size. The incision divides the skin, fat, and fascia down to the tumor, the flaps are then dissected back exposing the growth which is seized with volsellum forceps and suitable traction made outward and downward or upward according to the method the operator chooses, to turn the tumor including the gland out of its bed.

Some surgeons prefer beginning above, ligating the temporal artery as soon as reached, and others as the dissection proceeds, between double ligatures; while others begin below and work upward, isolating the external carotid and tying with two ligatures between which the vessels are divided with scissors. By severing the few fibrous bands below at the point where the carotid is divided, the mass can be raised well out of its bed, aided by blunt dissection with the fingers, handle of the scalpel, or the moderately blunt elevator that is commonly used to enucleate tumorous masses. The facial nerve is likely to be severed especially if the gland is indurated and mostly converted into morbid tissue. Care should be taken howerer not to injure the internal

jugular vein and other vascular branches that abound deep in the neck if they can be possibly avoided. To avoid bleeding from the smaller vessels the tissues encompassing them should be divided with scissors instead of the knife as the former, in a measure, bruises the coats of the vessels causing them to collapse, quickly lessening the escape of blood.

Not infrequently the tumor mass is quite firmly attached to the mastoid and styloid processes and to free these attachments an elevator with rather sharp edge, can be utilized to advantage. During the dissection little attention need be paid to hemorrhage from the smaller vessels, the removal of the growth being of greater importance, after which, the bleeding points can be picked up with greater ease. Oozing of blood from raw surfaces may be promptly staunched by the application of gauze sponges, wet in hot water having a temperature of about 118 degrees to 120 degrees F. or adrenalin chloride if at hand may prove just as efficient.

It often proves to be the case that growths of quite large size are more easily removed than smaller ones that are situated near some of the important vessels ramifying throughout the glandular structure. If for valid reasons the major portion of the gland cannot be removed, the free portion can be cut away and if necessary on account of a return of the growth the remainder may be removed at a later date. After the growth. has been removed and the wound freed of bloody fluids the flaps are approximated and sutured with catgut, drainage being provided for in the lower part of the wound by the placing there of a twisted strand of iodoform gauze. The external wound should be dressed antiseptically and redressed as often as the nature of the case requires it.

Some operators prefer ligating the external carotid as a preliminary step to lessen the amount of blood usually lost during the operative procedure when this is not done. The removal of the entire gland for the cure of malignant disease of that structure, when well advanced has not been attended with the success that would justify the undertaking of such a severe operation. The record of many cases shows a return of the disease, in most cases, within six months to a year. More favorable

will be the result if the nature of the growth is discovered early and the entire gland removed.

The treatment of fistula of Stenson's duct is entirely surgical, the object in view is to direct the saliva from the fistulous opening in the duct into the mouth, permitting the external opening in the cheek to heal. There are several methods of procedure in common practice by which this cure may be accomplished, all of them successful when properly executed. Establishing an internal communication with the fistulous opening in the duct by the Seton method seldom fails to bring about a cure.

Fig. 88a.—Treatment of salivary fistula by Seton's method.

It is done by passing two or more braided silk strands through the external opening into the mouth and out around the angle of lips where the ends are tied together. (See Cut). Under cocaine anæsthesia the work can be done without experiencing the least twinge of pain. Usually the required communication is established in a week or ten days, when the threads should be cut close to the wound on the external surface and removed by pulling on the opposite end. During the time the seton is in place the diet should consist mainly of fluids, that mastication may be dispensed with in so far as possible.

If the external opening is slow in healing its margins may be touched with a wooden tooth-pick which has been previously dipped in phenic acid. One or two applications usually suffice to stimulate the healing process. Desault's method of curing a salivary fistula is efficient and quickly executed. He forces a small trocar through the fistulous opening forward and inward entering the mouth opposite the second molar tooth. (See Cut). A heavy strand of silk is then drawn into the punctured track
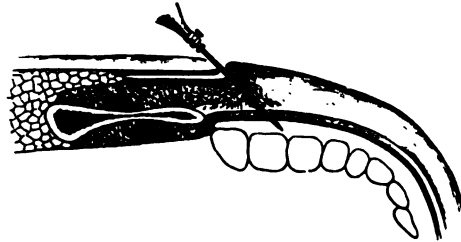
Fig. 88b.—Desault's method of treatment.

with the aid of a needle and the section that passes through the cheek retained, until a patent canal is formed through which the saliva can pass into the mouth. The seton is then withdrawn and the external wound allowed to heal.

There are several methods for dealing with the fistulous opening but nothing to commend them over the two above described when they are properly executed.
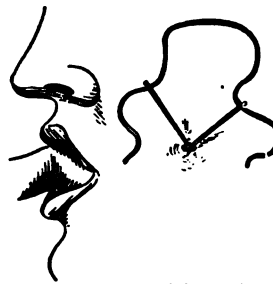
Fig. 88c.—DeGuise's method of introducing a rubber or silk ligature through the openings for the cure of salivary fistula. After introduction the ligature is tied tightly inside the cheek.

Fig. 88d.—The ligature tied.

WENS

Wens are cystic tumors varying in size from a pea to that of an egg. Their favorite sites are the head, neck and shoulders, although they may form on other parts of the body. The tumor forms within the skin or subcutaneous cellular tissue, is rather

slow of growth and contains sebaceous matter. To the touch the growth feels doughy and is devoid of tenderness or pain.

Fig. 89.—Wens of the scalp.

Treatment. The treatment is entirely surgical. The tumor and adjacent parts should be rendered aseptic with green soap and water followed with alcohol or ether. If the growth is small the skin and fascia should be incised at or near its base and then turned out of its bed; the little hemorrhage that follows can be controlled by pressure; dress with some potent antiseptic powder and bandage. To span the chasm left after the removal of the larger growths, an elliptical incision should be made through skin and fascia down to the sac, embracing the tumor when this is practicable; the growth is then dissected out, care being taken to remove all of the sac. After securing all of the bleeding points the edges of the scalp are approximated and secured with sterile catgut; a compress of sterile bichloride gauze is then adjusted over the wound and secured with a bandage. If the growth is simply divided in halves and the contents including the sac turned out, as advised by some operators, the healing in of the redundant skin flaps still leaves something of a tumor at the site of the wen. Evacuation of the caseous material without removing the sac only invites a return of the growth.

TRACHEOTOMY

The making of an artificial opening in the trachea either above or below the isthmus of the thyroid is frequently required to give relief in cases of threatened asphyxia from croup, diphtheria, stenosis, edema of the glottis, and the removal of foreign bodies from the trachea. Operations upon the throat may require a previous opening of the trachea to prevent suffocation by the entrance of blood into the tube.

Unless the nature of the affection requiring the operation makes it impracticable, the trachea should be opened above the isthmus as important vessels and nerves lie in close proximity to that part of the trachea usually opened below the isthmus. A little deviation from the normal position of the anterior jugular vein and innominate artery may place these vessels directly in the field of operation, where they are subject to injury in emergency cases when the operation is undertaken with poor light and assistants, and under the stress of circumstances incident to impending death.

The nature of the cause leading up to the operation usually requires that it be done as quickly as possible. There is hardly time to prepare the patient for aseptic work. It is possible in most cases to sponge the neck hurriedly with alcohol, hot salt water, or ether before making the external incision.

In children and nervous persons the operation is done under chloroform anæsthesia, others will withstand the little nervousness and pain after the local use of cocaine used hypodermically as there is little pain attending the operation after passing through the skin and fascia. Preparatory to executing the work the patient should be placed in a good light, upon the back, with a cushion or pillow beneath the neck and the head thrown well backward. The length of the incision will depend upon the depth of the tissues between the skin and trachea; it should be at least two inches in length and extend from a point over the cricoid cartilage downward as near the median line as possible. After dividing the skin and fascia the interval between the sternohyoid muscles is sought, down through which the tissues are carefully separated with a groove director, only dividing with the knife or scissors, tough bands of fascia encountered

in the dissection. As the dissection progresses, the edges of the wound are separated with retractors if these are at hand, otherwise very useful ones may be quickly fashioned by bending the end of the handles of a couple of teaspoons to the required shape. To avoid wounding the blood vessels they must be noted as the work progresses and pulled to one side. If by accident a vessel is divided it should be clamped at once and the operation continued.

As the trachea is approached the isthmus will be seen in the bottom of the wound, this may be pulled upward or downward or it can be divided if additional space be desired, although there will be more hemorrhage to contend with if the latter is done. If time is not a feature in the work all divided vessels should be ligated at once, otherwise they should be clamped and ligated after the trachea has been opened and a better condition of the respiration restored. The hemorrhage that is encountered is mostly venous and is sometimes persistent on account of the pronounced cyanotic state of the patient. As soon as the trachea is opened and a better respiration is established the hemorrhagic oozing ceases.

When the trachea is disclosed it can be picked up and steadied by two tenacula trusted in the hands of assistants. It
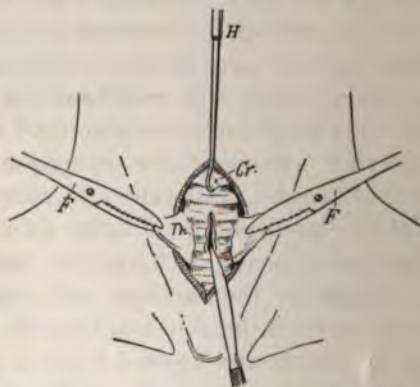
Fig. 90.—Tracheotomy. By dividing the isthmus of the thyroid body the trachea is exposed. *Th*, the divided ends of the isthmus of the thyroid body held apart with forceps, *F; Cr,* the cricoid cartilage is hooked and securely held with a long, sharp retractor. The incision is made from below upward.

is then opened with a sharp bistoury, severing two or three of the rings cutting from below upwards. In thrusting the knife into the wall of the trachea care must be taken that the point does not penetrate far enough to wound the posterior wall of the tube, an accident not unlikely to happen in the haste often urged to give breath to a suffocating person. All hemorrhage must be controlled before opening the trachea; the reason for this is obvious.

As soon as air enters the lungs through the tracheal opening the dyspnea soon subsides although there is usually, at first, more or less spasmodic coughing with an issuing of bloody mucus. The straining effort at coughing may start a fresh flow of blood that is likely to provoke a temporary fit of coughing and difficult breathing.

If the operation is performed for the relief of croup or diphtheria, any detached membrane or tough strings of mucus found resting near the opening should be removed before replacing the tracheotomy tube in the opening. If time and circumstances permit, the air in the room in which the operation is executed should be saturated with moist heat.

As soon as the respiration becomes somewhat normal the tube is inserted and fastened in place by pieces of tape fastened in the fenestra in the flanges of the instrument and tied around the neck in a manner not easily displaced. The inner tube is removed and cleansed as often as it becomes clogged with mucus or other morbid material of the trachea.

Should the patient become extremely cyanotic and cease to breathe while operating, the work should be proceeded with in all haste, and artificial respiration resorted to as soon as the trachea is opened. It is well not to close the wound in the skin tight around the tube after it is inserted as by so doing, air from the trachea is apt to escape into the cellular tissues causing some degree of surgical emphysema. The after dressing should be done with antiseptic powder, solutions and sterile gauze.

The swallowing of food is painful at first, hence it is necessary to prescribe a liquid diet which should be sipped slowly and through a tube if necessary. If for any reason the tube must be worn permanently it is advised that a silver instrument be

substituted for the rubber one, as the latter is apt to excite both irritation and profuse watery discharges.

If tracheotomy is done for the removal of a foreign body from the windpipe the wound in the trachea and overlying tissues is closed with catgut as soon as the object sought for is found and extracted.

Complications following the operative work, should be treated in a manner as the nature of each will suggest.

FOREIGN BODIES IN ESOPHAGUS, PHARYNX, LARYNX, AND TRACHEA

Not infrequently pieces of meat, crusts of bread, or other articles of diet, besides pins, buttons, small tin whistles and fish bones, find lodgment in the upper part of the trachea or esophagus, suddenly placed there in the act of coughing, sneezing, yawning or laughing and swallowing food, improperly masticated.

Immediately following these accidents violent fits of coughing ensue, the patient gasps for breath, the features turn purple, the eyes are staring and protrude, and the patient begs by gestures to those that are near to do something to relieve him of his distress.

Children while at play often force small articles that they may have in their mouths into the larynx or trachea by a sudden respiratory effort, and the laborer who is eating his meal against time, occasionally gets "choked" on a "hunk" of meat that will not go down.

Pins held in the mouth are frequently sucked into the trachea or esophagus, when suddenly drawing a long breath before sneezing or coughing; buttons, grains of corn and other small articles also find their way into the larnyx and trachea in the same way, in spite of the epiglottis that stands as a guard to the entrance of the respiratory tube.

Treatment. When choking from the lodgment in the pharynx of articles of food, retching and vomiting may promptly dislodge the obstacle, giving immediate relief; bending the head forward, with the mouth open while a few active slaps are ad-

ministered between the shoulders with the open hand usually dislodges a foreign body from the larynx or trachea, unless firmly held in chink of the glottis.

In cases where a piece of meat or other articles of unmasticated food lodge well down in the esophagus, efforts should first be made to remove it with esophageal forceps and failing in this,
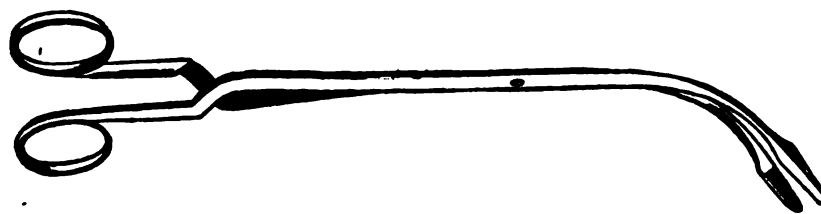
Fig. 91.—Esophageal Forceps.

the obstacle should be pushed through the muscular tube into the stomach, with a long firm male bougie, if one is at hand, otherwise a probang may be quickly fashioned out of a rattan cane or a green twig, which can be used in cases of impending death from suffocation. The tongue should be protruded and grasped between the thumb and fingers and pulled down over the lower jaw. A handkerchief placed over the fingers before seizing the tongue will prevent its slipping while at work. With the mouth opened wide and the head of the patient held slightly backward and steadied in the hands of an assistant, the improvised probang, lubricated with some kind of unguent that may be at hand, is quickly but carefully introduced into the esophagus and made to push the foreign substance down into the stomach. There is not much danger of entering the larynx with the end of the probang, as the epiglottis usually closes over this aperture over which the instrument glides with ease.

In cases where the life of the patient is in imminent danger from the presence of the foreign body and the methods spoken of having failed to dislodge it, esophagotomy should be executed without delay. The operation is done as follows: with the patient anæsthetized and the field for operation properly prepared, the patient should be placed upon the back with the head resting on a sand-bag or cushion. If the obstruction has been accurately located, it will aid in a measure the location in

which the external incision should be made. The muscular tube
is generally opened on the left side of the neck just below the
pharynx, the incision in the skin extending from just above the
cricoid cartilage downward to a point on a line with the upper
border of the thyroid cartilage, along the anterior of the sterno-
mastoid muscle, should divide at one sweep the skin, fascia and
the platysma myoids. The remaining tissues down to the
esophagus are divided by blunt dissection, utilizing the finger and
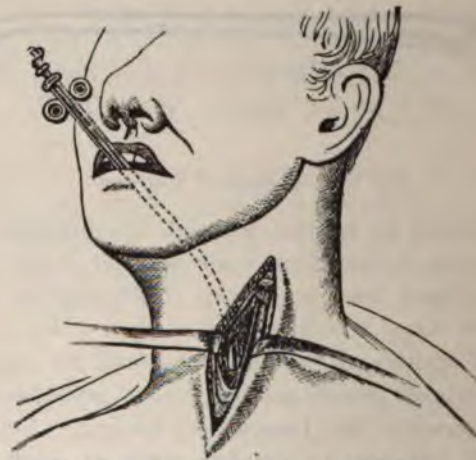
Fig. 92.—Esophagotomy. Utilizing a slightly curved sound
to bring the muscular tube into the incised wound. (*Howe.*)

the handle of the scalpel to execute the work. The carotid ves-
sels and the nerves are pulled to one side with retractors as they
are brought into view. The gullet is located and made to bulge
into the gaping wound in the neck by introducing a steel sound
or a long silver catheter into the upper end through the mouth
as shown in the accompanying cut.

In executing this work if sheaths of muscles and dense
fascia are encountered, they should be divided on a groove
director, great care being taken not to wound the vessels and
nerves resting over the gullet. As the thyroid gland is exposed
it should be forcibly pressed inward, exposing the trachea just
behind which, and a little to the left, will be found the esophagus
which will be at once recognized by its dark red color and the
longitudinal arrangement of its fibers. The gullet is next picked

up with mouse-tooth forceps and drawn well into the wound where it is firmly held while being opened. The incision in the tube should be an inch or more in length and as near as possible on a line with the incision in the skin. Unless the foreign body is directly cut down upon and removed, its location will have to be determined by introducing the finger through the incision in the tube. When this is done the foreign body is seized with forceps and removed.

The wound in the esophagus is then closed with two rows of catgut sutures, the first row merely including the margins of the mucous membrane and the second row the muscular walls, unless, for some reason, a permanent esophageal fistula is required, in this case the margins of the mucous membrane should be united to those of the skin by silk-wormgut sutures. The external wound in the former case is closed with catgut and dressed with sterile gauze pads and lightly bandaged. In cases of permanent fistula the open wound is kept covered with sterile gauze which is changed as often as it becomes soiled with mucoid discharges. If, by accident, some one of the blood vessels is severed it should be picked up and ligated at once or clamped and tied after the esophagus has been opened and the obstruction removed, relieving the impending suffocation.

Not much hemorrhage is encountered in approaching the esophagus if the above directions are followed and what takes place when the wall of the muscular tube is incised can usually be controlled by pressure.

Without complications the wound in the tube and neck will be healed in two weeks and during this time the patient is to be fed on fluid food, swallowing a little at a time and as often as the condition of the patient requires. In cases of permanent fistula a compress may be pressed over the opening in the tube when making efforts to swallow fluids. Feeding by rectum may have to be resorted to at times in order to sustain life.

If foreign bodies cannot be removed from the larynx and trachea by the methods advised in another part of this article, resort should be made at once to tracheotomy, or laryngotomy, the former operation is described in another part of this work, the latter is executed as follows: the neck is properly prepared and the patient placed under chloroform anæsthesia. The pri-

mary incision an inch or more in length is made in the median line over the crico-thyroid space which can usually be located with the finger about an inch below the pomum Adami. The skin, fat, and fascia are divided down to the trachea, the margins of the wound separated with retractors and all hemorrhage controlled. If blood vessels of any size are divided they should he picked up and ligated at once, or by leaving the hemostat on the severed vessel a few moments it will cease to bleed. On reaching the crico-thyroid membrane it is opened by making a vertical incision from below upward; if the opening proves too small for the removal of foreign bodies it can be enlarged by extending the incision downward through the cricoid cartilage. This is often required in fat necks, especially when done to relieve spasm of the laryngeal muscles when no tube is at hand to insert into the opening. To insert a laryngotomy tube into the opening is to provoke a severe fit of coughing for a few moments, unless the mucous surfaces immediately surounding the opening are benumbed with a solution of cocaine sprayed or applied with a cotton swab.

Thyrotomy is sometimes required for the removal of foreign bodies, morbid growths, and the treatment of ulcers, stenosis, and fractures of the body of the thyroid cartilage. Before executing this operation usually a preliminary tracheotomy is done and the upper part of the trachea packed with sterile gauze above the tracheotomy tube. This done the head of the patient is thrown well backward and held firmly in the hands of an assistant. The skin, fascia, and cellular tissue are then divided down to the projecting angle of the thyroid cartilage by a median incision an inch and a half or more in length. The thyroid cartilage is then divided exactly in the median line from the crico-thyroid membrane upward throughout its entire length; this is done with a curved bistoury or strong blunt-pointed scissors. By keeping exactly in the median line the vocal cords are separated at their anterior attachments without injuring them. Some operators prefer to leave the upper border of the larynx uncut whenever possible, that the relation of the vocal chords may be the better preserved. More or less injury is generally done to the thyro-hyoid and concoid ligaments and mem-

branes of the larynx when retracting the lateral halves sufficiently to expose the interior of the cavity of the larynx.

After accomplishing the object of the operation the edges of the cartilage are accurately approximated and secured with silver-wire suture, and the external wound with catgut and all covered in with sterile gauze held in place with strips of adhesive plaster or lightly bandaged.

The laryngotomy tube previously inserted should be left in place for a few days or until any possible swelling of the soft structures of the larynx has subsided, that might otherwise seriously interfere with the patient's respiration. When it is removed the external wound may be closed with a catgut suture or left to granulate.

GOITRE

Goitre is the name applied to an abnormal growth of the thyroid gland. In structure the tumor may be cystic, vascular, follicular, amyloid, and parenchymatous. It is seldom if ever observed in children but is frequently noted in middle life and in women more often than men. Individuals living in mountainous regions and those of a strumous habit of body are prone to the disease.

By some medical observers the cause of the disease is attributed to the drinking of water devoid of iodine and other ingredients that are necessary in maintaining normal action of the human economy.

The hypertrophy may involve only a part of the gland when that condition known as nodular goitre exists, if the whole gland is involved in the swelling of the morbid state is known as the diffuse variety of the disease. In the former variety the inflammatory action seldom runs very high but increases in activity in proportion to the number of nodules found developing throughout the glandular substance. The nodules become cystic in many cases the enclosed fluid being of a glue-like substance (colloid). and opaque in character. Their development is slow but gradual.

In the second variety of the disease but little inflammation exists and while the development of the growth is somewhat rapid

yet few symptoms appear that characterize the nature of the
ailment outside of pressure distress, difficulty in swallowing,
and the unsightly appearance of the morbid state. The pressure
pain is not acute but respiration is often impeded and the voice
changed to a marked hoarseness by the encroachment of the
growth upon the trachea and the recurrent laryngeal nerve.
Pressure is also responsible for the dilated and tortuous state
of the blood vessels observed in pronounced cases of the disease.

The vascular disturbance thus produced reacts upon the

Fig. 93.—Cretinism.   Aged twenty-four years; height,
thirty-four inches; weight, forty-seven pounds; features,
characteristic. (*Farnum.*)

heart producing what is recognized among medical men as goitre heart, the manifest symptoms being irregular and excited action of the vascular organ upon the least physical exertion.

The true goitre should not be confounded with the temporarily enlarged gland observed in individuals who have suffered mental or physical strain; this form of the disease soon subsides under a short period of rest and relief from the exciting cause.

Children born with a dwarfed state of the thyroid glands and others who later in life have had the most of the organ surgically removed soon develop a morbid state of both mind and body; the former bordering on imbecility with manifest wrongs in the development of certain parts of the body, a condition known as cretinism. A similar condition of mind follows the removal of the gland in the adult; the tissues become puffed especially about the face and hands from the effusion of a mucus-like fluid in the subcutaneous tissues. This morbid state is known as myxedema.

Expophalmic goitre or Grave's disease is another variety of the enlargement of the thyroid gland characterized by protrusion of the eye-balls, anemia, nervous disturbances, and increased frequency of the heart action in most cases. Women suffer attacks from this form of the disease more frequently than men and it usually appears about middle life. In the worst form of the disease hoarseness and difficult breathing are common symptoms. Aphonia may result in marked cases due to pressure or other involvement of the larynx.

Treatment. The simple forms of goitre are amenable to the action of remedies applied externally and taken internally. At the outset it will be well to ascertain the cause and if found remove it if possible.

Externally some one of the-potent iodine mixtures should be applied over the surface of the growth once or twice a day. If the morbid state be due to a strumous condition of the body, iodide of potash in five to ten grain doses three times a day well diluted will be indicated. The specific tincture of aconite and pulsatilla will greatly benefit cases due to prolonged mental worry and menstrual irregularities, and these remedies may be alternated with cactus and avena in cases where the patient

is suffering from weak heart and pronounced physical weakness. While under treatment the patient should be calm and avoid worry and excitement as much as possible. Iris versicolor and phytolacca act favorably on glandular swellings and will prove beneficial in cases where the puffiness of the gland is caused by functional derangement.

In goitre appearing in anemic individuals and where hoarseness is a troublesome feature small doses of iodide of iron alternated with spongia will prove curative.

Fifteen drops or more of the tincture of iodine injected into the stroma of a bronchocele at three or four different points with a hypodermic needle will reduce the growth rapidly in many cases; the treatment should be repeated once or twice a week. Ergotine has been used by the same method with marked benefit in vascular cases. Electrolysis is advised by some medical gentlemen but the success that has followed its use in reducing the morbid growth has not been very promising.

In cases of long standing where the tissues have undergone degeneration, no form of medication will prove of lasting benefit, neither will operative measures give promise in every case, as many goitres will be brought to the surgeon's notice that are inoperable on account of the low vitality of the patient, brought about by long suffering from respiratory and vascular disturbance. Other serious ailments that have depleted the system will prohibit the formidable operation.

Cases that are not amenable to treatment by remedial agents and are suitable cases for operation may be greatly relieved by the removal of a portion of the gland by excision. Seldom is the attempt made to remove the entire gland, an operation fraught with great danger from loss of blood and the subsequent risk of the patient's health from the loss of the vitality imparted to the economy by the healthy gland.

To reach the gland a transverse incision is made from one sterno-mastoid muscle, across the front of the neck to its fellow on the opposite side, a short distance above the sternal notch; this incision divides the skin, fascia and fat down to the muscular structures. Check the hemorrhage from divided vessels and retract the flap of integument including the platysma, exposing the sterno-hyoid, sterno-thyroid, and omo-hyoid muscles which

should be retracted if possible or divided if necessary to enable
the operator to reach the goitre enclosed within its capsule;
check hemorrhage, carefully divide the loose fibrous capsule and
cautiously shuck it off the outward surface of the gland. If in
executing this part of the work any of the large veins surround-
ing the gland are severed, they should be picked up and secured
by ligature before proceeding further with the work; or if they are
discovered in time and are in the line of work and can not be
retracted to one side they should be divided between double
ligatures. The nodular portion of the gland is next loosened
and turned out of its bed, breaking up any fibrous attachments
by blunt dissection. As the morbid mass is pulled out of the
external wound, the superior thyroid artery and vein should be
brought into view double ligated and divided with scissors; as
the tumor is farther drawn out the inferior thyroid artery is
sought for and securely ligated with catgut. This blood vessel
is generally difficult to locate but the operator should remember
that it lies on the deep muscles of the neck and in close proximity
to the recurrent laryngeal nerve which by no means should be
included within the ligature.

Before the goitre can be removed the thyroidea ima artery,
a branch of the innominate artery or arch of the aorta must be
tied off. The gland may be liberated now with the exception of
the isthmus which should be grasped with a strong pair of for-
ceps, crushed and then ligated with a strong ligature of braided
silk.

In severing any existing attachments care should be exer-
cised not to injure the recurrent nerve that rests well back on the
gland; to obviate this it would be better to leave behind a small
portion of the glandular substance surrounding the nerve. This
completes the removal of the goitre from one side; if the opposite
side is involved a goodly portion of the gland including the
growth should be removed in a like manner.

Following the removal of the tumors, the wound is cleared
of operative debris with normal saline solution and gauze spong-
es; next, unite the divided ends of muscular structures with
sterile catgut ligatures, after which draw the lateral halves of
the fibrous capsule together in the median line, and close their

margins with catgut. The incision in the skin and external fascia is then closed with fine chromicized catgut, with provision made for drainage, using small perforated rubber drainage tubes, which should be left in place twenty-four to forty-eight hours.

It will be well to suggest here, before the operator cuts away the tumor mass after it is brought out of the wound, that the superior and inferior thyroid arteries be sought and tied. If difficulty is experienced in locating these vessels, they may be tied in continuity, or, if possible, the tissue embracing these vessels may be clamped with heavy artery forceps, the tumor then cut away, after which the divided ends of the vessels should be secured with dressing forceps and securely tied with silk or catgut. If troublesome oozing of blood follows the removal of the gland, the Paquelin cautery should be run over the raw and bleeding surfaces before closing the external wound.

Ligation of the thyroid arteries is sometimes done to cut off the blood supply, hoping thereby to bring about atrophy of the growth in decidedly vascular goitres and other forms, where excision or enucleation will be impracticable. When one side is affected with the nodular form of the disease, and the other side seems healthy, it may be possible to enucleate the morbid mass through an incision made over the protruding growth. It is well to bear in mind, and to acquaint the patient with the fact, that there is a disposition for any portion of the gland left behind to take on morbid action and develop secondary growths that often attain a considerable size. To remove such as these the surgeon often encounters serious difficulty in dealing with the scar tissue resulting from the previous operation.

EXOPHTHALMIC GOITRE

Exophthalmic goitre is a common form of disease of the thyroid gland, in which the body suffers morbid changes (intoxication) through the presence in the economy of a superabundance of tissue-elements.

Without entering into a description of the anatomical re-

lationship of the thyroid gland to the larynx and trachea and
adjacent structures, which is fully discussed in the works on an-
atomy, the author will pass at once to the symptoms usually
observed in marked cases of the disease. The disease appears
in an acute and chronic form and may run a rapid course, al-
though the tumor has a slow growth as a rule. The cases of
rapid development show a greater systemic derangement and
a slower recovery from either remedial or surgical treatment.

There are numerous symptoms characteristic of this form
of goitre, such as increased frequency of the pulse, which ranges
between 90 and 150 and may continue over a long period of
time, active exercise and excitement reflects upon the heart's
action, often causing violent palpitation. There is bulging of the

Fig. 94.—The cut shows the appearance of the eyes in a
case of exopthalmic goitre. (After *Foltz.*)

eye-balls in most cases, giving a staring appearance to the eyes
and a tremor to the lids; tremors of the extremities are observed
in marked cases. The patient often complains of headache and
vertigo and often shows an irritable disposition; functional de-
rangements of the digestive organs are not uncommon. The
enlarged thyroid gland is traversed with great dilated blood

vessels and the blood coursing through them gives off murmurs readily noted through the stethoscope. The growth, however large, is seldom tense and never nodulated; it is usually soft and easily compressible.

Treatment: The treatment of Grave's disease is by both medical and surgical measures. The direct action of specific phytolacca, and iris versicolor, when given internally in small but frequent doses often reduces the morbid growth in the early stages of its progress. The action of these remedies is aided by the external application of the following mixture once or twice a day:

R.
Iodine .... gr. xl
Potassium Iodide .... gr. lxxx
Alcohol .... fl. ℥ iij
M. Sig.—For external use.

A few drops of ergotine or thuja injected deep into the stroma of the tumor once a day will prove of benefit, especially if the growth is exceedingly vascular. Habits of life that in any way aggravate the morbid condition and bad hygienic surroundings should be corrected while the patient is undergoing treatment.

Chronic cases and others that will not yield to medicinal treatment, that gradually grow worse, should have a portion of the tumor surgically removed or the thyroid arteries ligated, if the physical condition of the patient will permit of the procedure. The technic of the operation is given in the treatment of goitre elsewhere in this volume.

TUMORS OF THE LIPS

The lips are frequently the seat of cysts, fibrous, vascular and malignant growths that are due to various causes.

Cystic tumors are quite common and are due to obstruction of one or more mucous follicles. They vary in size and density, contain a glairy fluid, and appear as a globular swelling on the mucous surfaces of the lips. They are tender during development, but not especially painful. The growth should be incised, its contents turned out and the cavity cauterized with

pure phenic acid, following which, the wound should be dressed with antiseptic washes. Many cases will only require the evacuation of the gelatinous contents and a cure quickly follows. The fibrous growth has its origin in the sub-cutaneous tissues near the margin of the lip. Its development is slow, and sometimes attended with tenderness and pain. If not molested, it often attains a considerable size, seriously disfiguring the features. This form of growth should be removed by excision. If done at an early stage, this may be done by a V-shaped incision, including the growth; at a later period it will, of necessity, have to be dissected out, thereby sacrificing a greater amount of tissue. If possible, the margins of the wound are approximated and secured by a number of sutures, otherwise skin flaps will have to be provided for from the near-by surfaces, or the wound permitted to heal by granulation.

Of the malignant growths that appear on the lips, epithelioma is the most frequently met with. The morbid disease occurs in men oftener than women, and usually appears at the site of a crack or fissure in the lip, caused, in many instances, by the pressure of the pipe stem in smokers, however, these growths are often observed in men that do not smoke; it is then due to some other form of irritation. Its first appearance is that of a small tender tubercle and develops upon a hard base. It may spread along the margin of the lip, but it more generally dips down deep into its substance. Unless its progress is arrested in its incipiency, it will continue to spread until it involves the whole lip, frightfully disfiguring the mouth. Sooner or later the lymphatic glands about the jaws and neck become involved and the features take on a pale, sallow appearance.

The only affection that the epitheliomatous growth is likely to be mistaken for is chancre. A correct history of the cause ought to materially aid in the differential diagnosis between the two affections. As marked above, epitheliomas usually appear in men (especially those who are smokers), and on the lower lip, the ulcer resting on a hard base with everted edges; the involvement of the glands not appearing until late in the disease; the ulcer, during this time, usually discharges a thin ichorous fluid.

A chancre may appear at any period of life, and in either

sex. It generally appears on the upper lip on a larger indurated surface with raised and inundated edges. The secondary symptoms following the syphilitic sore will establish the nature of the affection and usually yield to proper treatment.

The treatment of epitheliomatous growths is by excision. A V-shaped portion, including the ulcer in the early stages, the later phases of the disease requiring the removal of a greater portion of the lip and in many cases, the glands in the neck and a portion of the jaw, when the disease has involved the osseous tissue.

After the removal of the growth, the margins of the wound should be approximated and secured with sutures, or hare-lip may be utilized, where the strain on the sutures will be great. The after treatment should comprise both local and general measures. The wound should be kept clean with anti-septic washes and gauze dressing, while the general system is improved with medicinal doses of arsenic, iron, the phosphates, and strychnia or quinia compounds.

The diet should be composed of eggs, beef, and milk and the various dishes which these articles enter into: chipped beef, oysters and game in season, pickled pig's feet and such vegetables as appeal to the taste of the patient. Wines and liquors find no place in the diet regime.

TUMORS OF THE NOSE

The nose, composed as it is of different forms of tissue, is subject to a variety of tumor formations. The growths commonly met with are adenoids, sarcoma, carcinoma, the fatty growth (lipoma), chondromata, and exostoses. Polypi, one form of adenoids, are found hanging from the vault of the nasal passage and may be so pendulous in formation, that they will present far into the anterior or posterior nares. Polypi and adenoids in general, are very pale in color, soft and gelatinous in structure and vary in size from a pea to that of a quail's egg.

The etiology is somewhat obscure, except the influence that heredity may display in these cases, owing to very young children being so frequently afflicted with these growths. The develop-

ment of polypi at a later period is usually due to inflammatory hyperplasia of the nasal mucous membrane. Enlargement of the tonsils is observed in most cases of nasal polypi, seriously obstructing the post-nasal passage.

The common symptoms noted in ordinary cases of nasal adenoids are a change in the voice; mouth breathing; the mouth is generally held open, and the nose is broadened, in cases where the growths are situated well in front in the nasal passage. The hearing is, to some degree, impaired when the growths are situated far back in the posterior nares, and there may be cough and headache from local pressure. The use of a speculum and head-mirror will often disclose the presence in the nasal passage, of a gelatinous or semi-translucent mass, much resembling the pulp of a grape in some cases.

Lipomas or fatty growths have their origin in the fatty tissue about the sides of the nose, while exostoses are usually seen as spur-like processes, springing from the bony structures of the nose and extending into the nasal passages; they are covered with mucous membrane and present a very red appearance. Outside of a certain degree of interference with breathing through the nose, there are no marked symptoms. Malignant growths may have their origin in any portion of the structures of the nose. Their development is generally slow and may be primary or secondary. The symptoms are tenderness, swelling and pain, accompanied with headache and discharge of mucus or a muco-purulent fluid from the nose.

Surgical treatment only, can give relief in the removal of morbid growths of the nose.

Instruments usually required are two small scalpels, sharp cutting scissors, angular and straight; dressing forceps, hemostats, nasal speculums, wire snares, mirror, polypus forceps, medium length; small, curved needles and needle holder, sterile catgut and silk, antiseptic solutions and sterile dressings, and for pos-nasal adenoids, a small and medium sized adenoid curette.

Polypi are removed with the snare or with the curette as advised under the head of **Polypi**, which see.

Lipomas may be removed through a small incision in the skin and fascia under local anæsthesia, after the parts have been

rendered aseptic. Cleanse the wound with antiseptics and close the margins of the incision with a buried suture or strips of zinc oxide plaster.

Malignant growths are to be excised or treated with caustics and antiseptics. The latter course may accomplish a cure in epitheliomatous growths with the proper internal treatment, if applied in the early stages of the disease; but little, if any good results from this form of treatment in sarcomata. No operative course can be outlined here to follow, except to apply strict antiseptic measures while executing the work. The character of each case will have to determine the extent of the operation necessary to remove the growth. The tumor should be removed early to prevent disfiguring the features as far as possible.

Exostoses are removed with a wire cautery or by torsion, under cocaine anæsthesia. The hemorrhage that sometimes follows the removal of these growths, is effectively subdued by plugging the nares with pledgets of lint or cotton, wet with adrenalin chloride and witch-hazel, one part of the former to five or six of the latter.

NASAL ADENOIDS

Redundant adenoid tissue situated in the nasopharynx often attains to such a degree of development as to practically occlude the post-nasal passage. These growths sometimes resemble polypi in the character of their formation. They are also spoken of as adenoid vegetations. These polypoid growths are common in early life and may be cystic or fibrocystic in the character of their development. The morbid state appears in many cases to be merely a hypertrophied condition of the adjacent tonsillar tissue.

Adenoids are usually determined by the characteristic symptoms usually accompanying the abnormal state. The child breathes mostly through the mouth, speaks with a nasal muffling of the voice, complains of deafness, exhibits a noisy breathing when sleeping. There is often present a nagging cough. The tissues of the throat are usually puffy or edema-

tous, which renders the voice husky, and there is frequently present a mucopurulent discharge from the nose. Their presence may also be determined by the aid of the throat and head-mirror, a speculum revealing the glairy pulp-like appearance of the growths.

Treatment: The treatment consists in the removal of the growths which should be done early in life to prevent, if possible, the habit of mouth-breathing. The operation should be done under general anæsthesia, that thoroughness may attend the work. In adults it is possible to remove the redundant tissue under local (cocaine, four per cent) anæsthesia.

The necessary instruments needed to execute the operative work will be a mouth gag, a Hooper adenoid forceps, snare, a medium and large sized Gottstein 'curette and a pair of long dressing forceps to carry a swab of stiptic lint to the wounded surface, if serious hemorrhage follows the operative work.

With the patient under anæsthesia and lying upon a table in a good light, the jaws are separated and held apart with the mouth-gag, the curette is then made to enter the post-nasal aperture and by a sweeping and scraping motion the redundant tissue is thoroughly removed, but to insure this being done, the forefinger is pressed into the nasopharynx and made to sweep over the entire traumatic space, freeing any loose fragments of tissue that may be still retained. The patient's head is then held over the edge of the table to allow the blood to freely escape from nose and mouth. If hemorrhage is too profuse, sweep over the bleeding surfaces a swab of cotton or lint wet in adrenalin choloride or ice water.

Some operators prefer to have the patient, especially if it is a child, sit upright in the lap of an assistant with its head resting against his chest or shoulders: he secures the arms of the child to its sides and firmly holds them there. The operator holds the jaws apart with the mouth-gag with one hand, while with the other he manipulates the instruments required to remove the growths. During this procedure, a second assistant holds a small pan beneath the patient's chin to catch the blood and mucus.

For a few days following the removal of the adenoid growths, the patient should, if old enough, gargle the throat

with weak salt water, or some alkaline wash to soothe the irritable traumatic surfaces and to prevent the blood stained sputum from tainting the breath. Seldom is any other post-operative treatment required.

FOREIGN BODIES IN THE NOSE

The nasal cavity frequently becomes the lodging place for insects, worms, and foreign bodies. The latter are usually introduced through the external orifice, although it is possible to force the same through the posterior nares in efforts at vomiting. Insects frequently enter the nostrils during periods that the individual is sleeping, often depositing their larva, which later hatches, soon developing into parasites that prove markedly irritating to the nasal mucous membrane.

Following the introduction of the foreign bodies, there will appear more or less of a rhinitis, soon eventuating in a serous or sero-purulent discharge from the nose. There will be present a burning pain, frontal headache, suffusion of the eyes, and not infrequently a hemorrhagic discharge from the nose. If the nostrils are mostly occluded, the individual will be compelled to breathe through the mouth. Convulsions have frequently occurred as a result of the morbid condition.

To thoroughly investigate the nasal cavities for the presence of foreign bodies, the patient had better be placed under a general anæsthetic, especially if a child. The work can be done in an adult under the local influence of cocaine. In many instances, the object can be dislodged by directing the individual to place a finger against one side of the nose, holding it shut, while strenuous efforts are made to forcibly blow through the side in which the obstruction exists. In the case of a small child, the surgeon should place his mouth over that of the patient, with the face protected with a handkerchief, suddenly forcing the breath into the mouth and pharynx, which generally expels the obstruction.

When the object can be seen, it may be seized with tenaculum forceps and dislodged, or it may be pushed backward

into the pharynx with a hard rubber catheter, when found lodged far back in the posterior nares.

The inhalation of chloroform or a spray composed of menthol, chloroform and alcohol, following that of a one per cent solution of cocaine will usually dislodge the larvæ and insects when discovered within the nostrils. The irritation to the nasal mucous membrane, caused by their presence is best treated with the alkaline solution diluted, used in the form of a spray, every three or four hours.

R.
    Chloroform ....—..... ℥ iij
    Menthol .... gr. v
    Alcohol q. s. ....—...........................fl ℥ ij
  M. Sig.—Use as a spray in an atomizer.

EPISTAXIS—NOSE BLEED

, Hemorrhage from the nostrils may be due to any one of several causes and is often serious in character. It may occur spontaneously or result from traumatism, either accidental or operative. It is often a troublesome feature in many systemic diseases, organic structural wrongs, and changes in the character of the blood, as may be noted in typhoid and typhus fever, hemophilia, purpura hemorrhagica, structural diseases of the kidneys and heart, and vicarious menstruation. Local disturbances such as ulcers, erosions, and varicose veins are also probable causes of hemmorhages from the nose, often difficult to control.

Treatment: As a rule, bleeding from the nose will cease of its own accord, if the individual can be placed at rest with the head and arms in an elevated position. Some surgeons advise that the patient keep the head hanging a little low, to prevent the flow of blood from running back into the throat. Much benefit will be derived from grasping the nose between the thumb and finger, holding it tightly, respiration going on through the mouth. Ice cold compresses to the nose and ice enclosed in a cloth and held to the back of the neck will prove serviceable in some cases. Pledgets of cotton wet with adrenalin chloride solution and inserted within the nostrils, is an effectual method of controlling the flow of blood.

If the nasal mucous membrane is supersensitive, cocaine may be added to the solution, one or two per cent solution being of sufficient strength to relieve pain and in a measure, blanch the nasal mucous membrane. Peroxide of hydrogen, full strength, has been injected deep within the nostrils with excellent results. In one of the most persistent cases of nose-bleed the writer ever saw, due to a blow upon the nose, where the blood flowed in a stream, liquid persulphate of iron, in liberal quantities, was injected well back within the nasal cavities, with the result that a large clot was formed, occluding the broken mucous surfaces, checking the flow of blood at once. Tannic and gallic acid in a twenty per cent solution, may be used for the same purpose and powdered burnt alum is not without its styptic effect, if applied to the bleeding surfaces on a cotton plug.

Once the hemorrhage is checked, the clot or cotton plug should not be removed under forty-eight hours, only then to be replaced if hemorrhage again reappears.

In extreme cases, where the above measures fail to check the flow of blood, plugging the nostrils will have to be resorted to. To execute this procedure, quickly, a pledget of cotton the size of the thumb of the patient and an inch or over in length is secured in the middle with a linen thread or braided silk strand twenty inches or more in length, which has first been passed through a medium sized silver or gum catheter, that is introduced through the nostril and made to appear in the pharynx, where the end of the cord is secured with forceps and pulled forward out of the mouth. Bellocq's canula is also used for the purpose of placing the cord through the nose. To alleviate the distress incident to this procedure, the nostrils may be previously swabbed with a four per cent solution of cocaine, to which a few drops of adrenalin solution has been added. Guided by the forefinger behind the soft palate, the plug is drawn into the posterior nares by pulling on the strand extending from the nose. As evidence that the cotton plug is in position, the patient will be unable to breathe through the nose. Immediately following the placing of the posterior plug, another of suitable size should be securely introduced into the anterior nasal orifice, the blood soon forming a clot between the two.

For some time after removing the tampons, the patient

should refrain from blowing the nose with any force; the nasal passage should be kept clean with antiseptic washes.

ETHMOIDITIS

Ethmoiditis is a term used to designate an inflammation of the mucous lining of the ethmoid cells, situated on a line of the eyebrows and base of the nose. The morbid condition may be caused by exposure to extreme cold wind, fumes from irritating substances, diseases of and growths appearing upon the nasal mucous membrane.

The symptoms usually present that are characteristic of the inflammatory affection are headache, sensitiveness of the eyes to light, sharp pain across the base of the nose and along the eyebrows, tenderness and not infrequently a muco-purulent discharge from the nose.

Treatment: The treatment of ethmoiditis should consist in removing the exciting cause at the outset, if this is possible. In the acute phases of the disease, teaspoonful doses of the following mixture often prove of much benefit:

℞.
    Spc. Tr. Aconite .... gtt. x
    Spc. Tr. Gelsemium .... ℥ ss
    Spc. Tr. Bryonia .... gtt. x
    Camphor Water, q. s. ....fl. ℥ iv
    M. Sig.—A teaspoonful every hour.

If the discharge from the nose is muco-purulent, echinacea should be substituted for the bryonia in the above prescription and calcium sulphide given in alternation in one-eighth grain doses in trituration.

Hot vapor from a boiling mixture of the following ingredient usually gives relief from the acute pain when inhaled from a paper funnel:

℞.
    Witch Hazel .... ℥ j
    Tr. Opium .... ℥ iij
    Essence of Cloves .... ℥ ij
    Aqua, q. s. ....fl. O j
    M. Sig.—Boil over a gas flame in a quart measure, over which
        the paper funnel is placed, and through the small end the
        steam is directed into the nose during inhalation.

Polypi and other growths, if found in the nasal cavity, should be early removed and necrotic tissue curetted away, following with antiseptic sprays of the alkaline solution well diluted.

In cases where the inflammatory action terminates in a collection of purulent matter in the sinuses, the latter should be opened and the morbid fluid evacuated as directed in the article on **Suppuration in the Frontal Sinus.**

ABSCESS OF ANTRUM OF HIGHMORE

Abscess of the antrum of Highmore is due to traumatism, extension of inflammation from the nasal cavity or the root of a diseased tooth. The extent of the injury done to the maxillary cavity and adjacent structure will depend, to a great extent, upon the gravity of the exciting cause and the resisting power of the patient against suppurative conditions.

The symptoms accompanying a purulent collection within the antrum are in many particulars similar to those observed in like conditions in other parts of the body. There are heat and throbbing pain in the nose and face, with more or less local swelling of the cheek. The teeth on the affected side are sensitive and the patient experiences rigors followed by fever and derangement of the organs of digestion. There is usually drainage of the purulent matter into the nostril when the head is held in a position favorable for this to take place.

Treatment: It will be necessary to evacuate the purulent fluid before any form of treatment will affect a cure of the morbid state. This can be accomplished usually by perforating the antrum through the socket of a tooth in the alveolar process, first removing the decayed teeth that are so frequently the cause of the abscess.

To execute the work the surgeon will need extracting forceps, a small bone drill, small probe, a groove director, and to reach the cavity by other routes it will be necessary to have at hand a scalpel, dissecting forceps, and hemostats.

The first molar tooth is generally drawn, above which the antrum is located, when no other tooth near the antrum is found in

a state of decay. Once the purulent cavity is entered it soon emp_ties itself unless the pus is too thick to escape through the small opening. In such cases the cavity should be injected with warm normal saline solution but never peroxide of hydrogen as the opening made by the perforator is too small to allow of the ready escape of the effervescing purulent fluid.

Give such remedies internally as the conditions will suggest and support the strength of the patient with peptics and tonics and good nutritious food.

TONSILS

The tonsils composed of glandular structure and covered with mucous membrane are subject to inflammation, suppuration and enlargement from the formation of tumors within the spongy substance.

Tonsilitis results either from cold or traumatism and gives rise to rigors, fever, pain and distress on swallowing, tenderness on pressure over the glands; jaw stiff and the mouth is opened with difficulty, especially if the inflammation goes on to suppuration (quinsy). The tonsils are red and swollen and covered either with tough mucus or pus-like accumulations at the entrance of the crypts in the glands. In cases where the inflammatory action runs high, suppuration is likely to occur in from two to four days. This condition is a little difficult to determine in many cases: only the appearance of the gland, the dyspnea, with possible fluctuation, will determine its presence.

Treatment: The treatment in the early stages of the disease is entirely antiphlogistic. With a small, rapid wiry pulse, associated with a bright red and swollen condition of the glands, accompanied with rigors, small, but frequent doses of spc. tr. of aconite and belladonna, should be given and the throat frequently gargled with a solution of witch-hazel and water or warm salt water; care being taken not to use these mixtures too strong.

If the pulse is full and bounding and the tonsils are swollen, tender and dusky red, spc. tr. of veratrum should be substituted for the aconite and the tonsils painted with the same every

two or three hours during the day. The neck behind the angle
of the jaws may also be painted with this potent agent to great
advantage in cases where the mouth is opened with great dif-
ficulty.

If the tongue shows a thick, creamy coating with a marked
fetor of the breath, sulphurous acid or sulphite of soda should be
alternated with the sedative mixture.

Phytolacca is indicated by pallid mucous membranes and
enlargement of the lymphatic glands and may be associated
with spc. tr. echafolta in suppurative states before and after in-
cision.

As soon as suppuration is suspected, the tonsil should be
incised with a curved bistoury, the most of the blade being
wrapped with cotton or a narrow strip of gauze, to prevent cut-
ting the tongue; there is not much danger of severing important
blood vessels and the liberation of the pent-up pus gives prompt
relief. A gargle of witch-hazel and water rapidly reduces the
local congestion and swelling, which lessens pain and renders
breathing much easier.

Chronic hypertrophy of the tonsils is not an uncommon
affection in adults, and is occasionally seen in children. There
are no marked acute symptoms. If the growth is of consider-
able size, there will be some disturbance of respiration, espec-
ially when asleep, and the voice is apt to be husky, catarrhal
symptoms are usually present to a greater or less degree and
deglution is often difficult.

Unless the growth is of a hard and cartilaginous nature,
it may be reduced in size by frequent application of comp. tr.
iodine or penciling it once every day or two with sulph. of cop-
per or silver nitrate; astringent washes and gargles have very
little reducing effect on the morbid growth.

When the medicinal means enumerated above fail to give
relief within a reasonable time, the removal of the gland with a
tonsillotome should be resorted to. The removal with the wire
snare is preferred by most operators, as by this method very
little hemorrhage follows and the operation is quickly done.
Antiseptic gargles should form the after-treatment for a week
or more.

In removing enlarged cartilaginous tonsils by dissection,

active hemorrhage is likely to occur from severing the enlarged blood vessels that traverse the gland. The bleeding vessels may be picked up and twisted, when they are seen, or small bits of ice may be repeatedly swallowed until all hemorrhage ceases.

PHARYNGEAL FISTULA

A small salivary fistula is sometimes observed in the anterior cervical region, which extends from the skin surface through the subjacent tissue and opening into the pharynx. No great discomfiture is experienced by the patient, except the slight irritation of the skin about the external opening, and the constant wetting of the clothing about the neck by the steady oozing of saliva. The canal is short, cord-like, and usually straight, although it may be somewhat tortuous.

Treatment: The treatment is simple and usually efficient; a blunt needle is adjusted to a hypodermic syringe, containing a drop or two of pure carbolic acid, the needle is introduced well into the canal and as it is withdrawn, the caustic is deposited along the sinus, care being taken not to force any of the fluid through into the pharynx. The acid stimulates the granulating process at once, and soon closes the canal. Seldom does the fistula need the second application of the caustic. The morbid state is usually due to ulceration, or punctured wounds.

STOMATITIS

Stomatitis is an inflammation of the mucous membrane lining the mouth and may be due to trauma, infection, syphilis, morbid growths, and the effect of irritating drugs.

In cases of simple stomatitis, the mucous membrane appears red in part, there are heat and tenderness in the affected areas and often puffiness; there is usually an increased flow of saliva, but not infrequently the mucous membrane is dry and pungent.

In gangrenous stomatitis (cancrum oris) the morbidly impressed areas frequently break down in ulceration, the mucous

membrane of the lips and cheek being the usual points of attack.

This form of the disease usually attacks individuals of feeble constitutions, with marked digestive disturbances. The morbid condition often accompanies tubercular affections, and is frequently observed in persons suffering from low grades of fever and scurvy.

After an inflamed patch of mucous membrane becomes abraded, the surrounding tissues soon take on a necrotic condition, exuding a foul smelling discharge which is very destructive in character and rapidly disintegrates any inflamed tissue with which it comes in contact. Children generally swallow the muco-purulent discharges from the necrotic areas, giving rise to irritation of the stomach and fetid breath, indicating sepsis.

Individuals suffering from this form of the disease often experience rigors and hectic fever, followed by great weakness, rapid pulse, and cold perspiration. In some septic cases, the poison is so intense that the glands about the neck become enlarged and very tender upon pressure.

Treatment: The treatment of stomatitis in its early stages will depend largely upon the presenting symptoms in the individual case. Usually there is more or less fever present, which will call for aconite or veratrum in small but frequent doses, alternated with phytolacca and belladonna to control the local inflammatory action and impress the glandular swelling about the throat. Spc. hamamelis is frequently indicated in the morbid state, taken internally, in small doses and applied locally in dilute form, either alone or in solution with hydrastis or echafolta.

Rhus tox will find a place in the treatment of this affection, when small vesicles appear upon the lips or cheek and the tongue shows the indications for the drug. As a local application to apthous patches, no remedial agent acts with greater effect than does the alkaline mixture, the formula for which is given in another part of this work, diluted to suit the individual case.

To control the fetid breath, emanating from ulcerated surfaces, no medicinal agent acts more promptly than does a mixture of chlorate of potash in water, ten or fifteen grains of the former to four ounces of the latter taken in teaspoonful

doses every hour or two. A one per cent solution of chlorotone in water, to which a little glycerine is added, will prove beneficial in these cases of ulcerative stomatitis, applied locally every half to one hour. All local remedies should be sopped on ulcerated patches and not rubbed on to further abrade the tender and friable tissue. Mouth washes should be prescribed for adults to be used ad libitum.

Special attention should be given to the general health. For anemic conditions, iron and arsenic will be required, while digestive disturbances may be benefited by the administration of carbo veg, lactopeptine, pancreatine and the lime salts.

Fluid food should compose the diet, which may consist of rich soups, broths, milk, eggs, custard and malted milk.

The internal treatment prescribed for some of the phases of simple stomatitis will apply with equal benefit in the treatment of the gangrenous form of the disease. Chlorate of potash in a two per cent solution should be prescribed when the mucous membrane is inclined to be pale, puffy and the breath giving off a foul odor, resembling that of putrid flesh. The functions of the kidneys and bowels should be regulated if found abnormal; cathartics can not always be given with satisfaction, hence enemas of glycerine and water, or a weak solution of sulphate of magnesia should be given instead.

Spec. tr. hydrastis and trifolium are to be given internally for their constitutionl effect in such cases as show the want of a tonic and alterative. Fowler's solution of arsenic in very small doses will also find a place in tubercular states.

Ulcers appearing on the gums or cheeks should be touched with peroxide of hydrogen, pyrozone, echinacea, a solution of nitrate of silver (5 to 20 grains to the ounce of water), and the alkaline mixture.

In the worst phases of the disease, the necrotic tissue should be curetted away, or touched with pure carbolic acid and afterwards treated with active antiseptic washes.

OSTEOMYELITIS OF THE JAWS

The central portion or medulla of the jaws not infrequently becomes inflamed as a result of traumatism or an extension of

suppuration from the root of a decayed tooth. When due to the latter cause, the affected area may extend immediately around the center of the infection or the entire osseous structure may be involved in the inflammatory process. Not infrequently the morbid condition extends to the gums, causing them to swell and often suppurate, producing what is known as a gum-boil.

In those cases where the necrotic state results from a decayed fang, the latter loosens in its socket, allowing the suppuration fluid to escape from the jaw bone up along its body. If pus finds its way along the external surface of the maxillary bone beneath the periosteum, there is formed what is known as an alveolar abscess. Not infrequently a considerable portion of the medullary portion of the bone undergoes suppuration, setting free small osseous fragments known as sequestra.

During the time the jaws are acutely inflamed, the patient is feverish, the gums are hot and tender, and there is more or less pain in attempts to masticate food. In cases where the morbid state passes on to suppuration either in the gums or the medullary space, the pain often becomes spasmodic and throbbing, especially in those cases where pus forms beneath the periosteum, elevating it from the maxillary process, forming an alveolar abscess .

The cheek is generally much swollen in these advanced cases and its often œdematous, pitting on pressure. The tongue is generally coated with a pasty yellowish fur and the breath is very offensive. If an abscess forms in the gums and is lanced or breaks of its own accord purulent fluid may continue to discharge through the open sinus for a long period of time unless checked through some form of treatment. A probe inserted through an open sinus will determine whether or not the osseous structure is bared of periosteum.

Treatment. When the nature of the ailment is determined early the patient should be given the following prescription:

R.
Spc. Tr. Aconite .... gtt. xv
Spc. Tr. Echinacea .... ℥ iij
Camphor Water q. s. ....fl ℥ iv
M. Sig.—A teaspoonful every hour or two.

In connection with the internal medicine a mouth wash com-

posed of the following ingredients can be used to the benefit of
the patient:

R.
    Witch Hazel ....-.......'......................... ℥ ij
    Salicylic Acid .... gr. xx
    Glycerine ....-................. ℥ iij
    Peppermint Water, q. s. ....fl O j
    M. Sig.—Use to rinse the mouth every hour or so.

If the case, when seen, is so far advanced as not to be amen-
able to the above treatment the gums should be incised to the
bone, which procedure will relieve the tension of structure and
congestion, and allow the escape of pus if suppuration has super-
vened.

If the external surface of the maxillary bone is found to be
in a state of necrosis the dead bone should be curetted or chisel-
ed away, the necrotic area cleansed with peroxide or a 1-3000
bichloride solution and the cavity packed or not as the surgeon
will determine by the nature of the case.

When, from the character of the individual case, a sequest-
rum is supposed to be present within the jaw-bone it should be re-
moved through an opening in the jaw made from within the oral
cavity, when feasible, with gouge-forceps or mallet and chisel.
the cavity cleared of necrotic tissue and drainage established.
It is not advisable to open the jaw-bone by an external incision
through the cheek except, perhaps, in cases where numerous
sinuses through the soft parts are found to exist, as ugly scars
are apt to follow the procedure.

As the general health of the patient is likely to be impaired
in serious cases of osteomyelitis of the jaws, tonics and stimu-
lants coupled with appetizing nutrients, together with exercise
in the open air should be advised.

SARCOMA OF THE JAWS

The giant-cell variety develops more rapidly and to a great-
er size than the small round-cell form of the malignant growth
and is usually met with in the middle and advanced periods of
life.

Sarcomata of the maxillary bones are quite frequently met

with in general surgical practice. The morbid condition usually commences in a necrotic cavity in the bones from which a diseased fang has been removed.

The symptoms usually accompanying these malignant growths are pain, tenderness, swelling and disfigurement of the features as the disease advances. The growth is malignant and the neighboring lymph-glands often taken on the morbid disease by metastasis.

Treatment. The treatment of the malignant disease is entirely surgical, a resection of the lateral half of the jaw involved in the morbid growth being required. The technic of the operative procedure is given in detail under the head of resection or excision of the maxillary bone.

FRACTURE OF THE SKULL

Fractures of the skull are usually due to direct violence, although the accident is frequently observed as a result of contrecoup, or the transmission of the force to the skull from the point of impact. The vault or top of the cranium generally receives the force of the blow, and as a consequence is more frequently fractured than other parts of the skull. Fractures of the base of the cranium are usually produced by blows upon the top of the head or vertex, resisted from below by the vertebral column; crushing force directed against the bones of the face, extending backward, and by falls upon the occiput.

Fractures of the cranium may be simple or compound; the fragments may be displaced or intact; depressed or elevated. If a portion of the skull is broken into several pieces this form of fracture is said to be comminuted; if simply fractured without displacement the injury is spoken of as fissured.

The symptoms following the simple fracture of the vertex involving both tables are temporary loss of consciousness, rupture of the dura mater and venous sinuses, and effusion of cerebro-spinal fluid beneath the scalp over the seat of fracture. Should the fracturing force be severe enough to lacerate the brain there is likely to be injury to the cranial nerves, blood vessels, with more or less extravasation of blood into or upon

the surface of the brain. In compound fractures very serious complications frequently arise. Fractures of this nature are grave in proportion to the nature and extent of injury done to the brain substance. Punctured wounds usually provoke more serious symptoms than do surface lacerations. Inflammatory action frequently follows compound fractures, and decomposition of fluids takes place on account of deficient drainage, and fatal meningitis frequently follows.

Fractures of the base of the cranium are attended with very grave symptoms. If the anterior fossa be complicated there is usually more or less hemorrhage from the nose, the blood being frequently mixed with cerebrospinal fluid. The sense of smell is often destroyed. Fracture extending into the middle fossa usually provokes more or less pulsation in the auditory canal, hemorrhage from the ear, and the sense of hearing is often destroyed. If the posterior fossa be fractured extravasated blood soon finds its way to the surface of the upper part of the neck and scalp, usually preceded by a tumefaction in the posterior part of the roof of the mouth. As complications there may be paralysis due to pressure, severe hemorrhages, septic infection, and cerebral hernia.

Treatment. The treatment of fracture of the cranium will embrace both local and general measures. In simple fracture of the vertex without depression, the patient should be placed at rest and cooling lotions applied to the injured part either in the form of solutions sopped on every hour or oftener if required, or cold applied through the medium of the ice-cap or rubber coil. As general measures the bowels should be opened with a saline draught, aided by enemas of glycerine and warm water. Irritable and feverish states of the body should be controlled by tangible doses of aconite, veratrum, gelsemium, and the bromides. In cases showing symptoms of depression, trephining should be resorted to at the outset of the treatment, and drainage provided for if the brain is found to be much lacerated, or much extravasation of blood. In compound injuries special care should be given to asepsis and drainage, keeping the lacerated parts clean with weak solutions of borax or boracic acid, to which a few grains of permanganate of potassium may be added with much benefit.

Fig. 94a.—Trephining the skull. Small cranial saw and
trephine. (*Howe.*)

In fractures of the base of the cranium much benefit will re-
sult from the constant use of the ice-cap around the base of the
skull especially where there is indication of hemorrhage. Where
there are symptoms of pressure from blood clots in fractures ex-
tending into the fossa, the affected region should be trephined,
the clot removed if possible and provision made for drainage.
Fractures in the base of the cranium are always dangerous, es-
pecially if the injury extends into the posterior fossa.

Unless grave symptoms supervene, following fissured frac-
tures of the vertex and fractures of the base of the cranium, op-
erative procedures should not be resorted to, but all compound
injuries to the skull should be sufficiently enlarged to admit of
the removal of spiculæ of bone and other foreign matter, the dis-
infection of the wound and the establishment of drainage. Un-
less there is evidence of paralysis following depression of a limit-
ed area of the skull, operative measures to elevate the depressed
portion are interdicted, being governed by the clinical results of
like operations in the past. The formation of large clots of blood
following lacerated injuries to the superficial vessels should be
removed by trephining, and the hemorrhage arrested by ligature,
tamponing, instrumental pressure, or trephining and tying the
bleeding vessel on the proximal side of the wound.

FRACTURE OF THE NASAL BONES

A fracture of one or more of the nasal bones is a frequent injury and may be simple or compound, complicated or comminuted. The displacement of the fragments is usually backward, or backward and to one side, depending upon the nature and the direction of the force that produces the injury. Not alone are the nasal bones fractured from the direct force, but frequently the cartilages are broken or separated from their bony attachments. The common causes of fracture of the nasal bones are kicks, blows, or the force received from flying missiles.

The force that breaks the nasal bones frequently extends to and fractures the ethmoid, and the adjacent portion of the superior maxillary; and as a complication, the nasal duct may be lacerated, and the mucous membrane more or less torn.

The usual symptoms present in fracture of the nasal bones are pain, swelling, deformity, mobility, and crepitus. The extent of the fractured injury is very well determined by grasping the nose between the finger and thumb, making lateral pressure to and fro. Injuries to the vomer will have to be determined by inserting the ends of the little fingers within the nostrils, making lateral motion, or with nasal forceps, fashioned for this purpose. Unless the patient is seen soon after the reception of the injury, the swelling that follows often masks the true state of the parts. Hemorrhage more or less severe, always accompanies fractured injuries to the nose. Marked puffiness about the eyes is a common symptom of nasal fracture, occasioned by infiltration of blood and serum, or emphysema. Obstruction of the lachrymal duct is followed by an overflow of "tears," and the inability to breathe through the nostrils is due to the extreme swelling, or puffiness of the mucous membrane. In compound injuries, there is likely to follow a greater or less amount of suppuration.

If the digital exploration within the nostrils occasions severe pain, which it does in the majority of cases, the patient had better be placed under the influence of an anæsthetic, for it is very necessary that the true state of the injured parts be determined and all displacements adjusted at the outset, before the displaced fragments have had time to unite.

Treatment: The treatment consists in replacing the displaced fragments, if such a condition exists; the arrest of hemorrhage, and the placing of nasal splints within the nostrils in cases demanding such support. The foregoing steps are not always easily accomplished, as any surgeon will testify who has had many cases of nasal fracture to treat. If possible, the hemorrhage, when profuse, should first be controlled; this is usually accomplished by swabbing the bleeding surfaces with a solution of cocaine and adrenalin chloride, proportioned by adding one part of a four per cent solution of the former, to two or three parts of a fifty per cent solution of the latter, made with a good distillate of hamamelis; this mixture is best applied to bleeding surfaces on pledgets of absorbent cotton, the cocaine added diminishes, to a great extent, the sensitiveness of the mucous membrane, which aids materially in further manipulations. Profuse hemorrhage threatening fatal syncope, will demand a more active astringent than the above; here no styptic agent is more to be relied on than liquid persulphate of iron, applied on pledgets of cotton or thrown into the nostrils with a good spray atomizer. The next in order is the reduction of the displaced bones. If this can be done by digital manipulation, well and good, otherwise the blunt dissector, or a small elevator will aid greatly in the work. Once the bones are placed in position, they usually remain, but in some cases of compound injuries of this nature, the use of the hollow nasal splint, placed in the nostrils controls the hemorrhage, holds the broken fragments in place, and permits breathing through the nose. After twenty-four to forty-eight hours, the nasal splint should be removed and cleansed in some potent antiseptic fluid and replaced in the nostril, after the latter has been sprayed with some alkaline antiseptic solution. This process should be repeated from day to day, as long as the splints are required. The nasal splint previously mentioned, when introduced into each nostril, will prove useful in cases of separation of the cartilaginous septum from the vomer; otherwise this form of injury will require the adjustment of a pair of nasal forceps, specially fashioned, that they will hold the fractured parts in position. The suppuration that often follows compound and comminuted   d to denuded and necrosed fragments,

of alkaline antiseptics until they work themselves out, or are removed by the surgeon.

FRACTURES OF THE ZYGOMA AND MALAR BONE

Fracture of the zygomatic arch is not commonly met with but when it does occur it is always due to direct violence, resulting from blows, kicks, falls, or crushing injuries. A simple fracture of the arch usually gives but few symptoms indicating the nature of the injury; but when the violence producing the fracture has been great, a portion of the bone may be depressed, the soft overlying structures lacerated, and severe injury done to adjacent parts. The common symptoms observed in fractures of the zygoma are bruising of the overlying tissues, extravasation of blood into the surrounding tissues and the orbit, and hemorrhages from the nose, and not infrequently the mouth. If the fracture injury extends to the malar bone, there is more or less flattening of the outer part of the cheek, which depression is easily determined by pressure with the fingers. There is likely to be more or less anæsthesia in the tissues of the side of the face if the superior maxillary nerve is, to any extent, complicated in the injury.

Treatment: In simple fracture of the zygoma, with little or no depression and but little injury to the surrounding tissue, no treatment is demanded except such as is usually advised to reduce swelling and contusions. This will comprise cooling lotions and topical application of such liquid agents as will alleviate painful states. The following mixture will prove efficient here:

℞.
Menthol Crystals .... grs. xx
Ether .... ℥ j
Spirits of Camphor .... ℥ iv

M. Sig.—Apply to painful parts every hour or two.

In cases where the bone is depressed the displaced portion .... and raised with an elevator, or a slender .... carefully thrust under the deposition. Once the frac-

ture is reduced, there is little danger of its recurrence. The swelling and ecchymosis gradually subside under the influence of the cooling lotions, and but little trouble will be experienced in opening and closing the jaws after the first few days. Complications arising from crushing injuries will have to be treated as the individual case will suggest.

FRACTURES OF THE SUPERIOR MAXILLA

Owing to the well fortified position of the superior maxilla the bone is seldom fractured, although its several processes are not infrequently separated from the body of the bone. When this bone does suffer from fracture, it is usually the result of gunshot or direct violence, as from a kick, blow, or fall, the face coming in contact with some sharp, hard object. One or both maxilla may be broken by the same cause, and suffer a multiple or comminuted fracture. Attempts at suicide by shooting, the muzzle of the weapon being held in the month, produce grave fractured injuries to the superior maxillary bone.

To determine a fractured state of the superior maxilla is usually not a difficult task, as the resulting deformity, displaced fragments, and crepitus that can frequently be obtained by manipulation, present reliable evidence of the nature of the injury.

Treatment: The treatment required in fracture of the superior maxilla is the adjustment and preservation of any and all detached portions of the bone that is possible. With the finger in the mouth to produce pressure, and the thumb of the same hand to make counter-pressure from without, the displaced fragments can usually be pressed into place. In exceptional cases, where the bone is driven far back against the pharynx, the aid of a blunt hook may have to be called into use in adjusting the fracture.

A section of the jaw having been misplaced, can, on readjustment, be retained in position by passing a slender silver wire around the teeth on either side of the fracture. Fragments of bone that are mostly denuded of tissue, and are apt to become necrosed if left with the expectation that union with other surfaces will take place, had better be removed at once.

A profuse flow of saliva often follows fractures of the superior maxilla, and the complete obliteration of the lachrymal canal, should that tear passage become involved in the injury. In cases where the fractured injury extends into the mouth, frequent rinsing of the oral cavity should be made, to prevent infection. If no complications arise, the repair usually is complete in from twenty to thirty days.

FRACTURE OF THE INFERIOR MAXILLA

Owing to the prominence of the inferior maxillary bone, it suffers fracture more frequently than other bones of the face. The common causes of fracture of the lower jaw are kicks, blows, falls, and gunshot injuries; and the character of the injury may be simple, compound, comminuted, and complicated. The most common seat of fracture of the lower jaw is at a point about on a line with the last molar tooth, or just in front of the insertion of the masseter muscle, although fracture at the symphysis is a common accident.   Fractures taking place
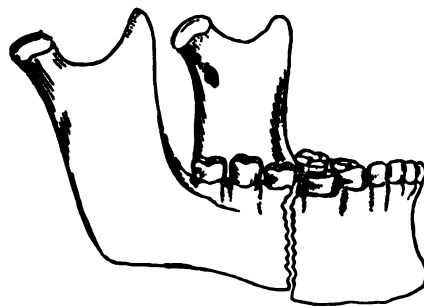
Fig. 95.—Fracture of the inferior maxillary.

through the neck of the condyloid or coronoid processes are somewhat infrequent, and are usually associated with other fractures which are produced by crushing violence. Portions of the lower jaw, weakened by inflammatory action following ulceration and necrosis caused by infection from decayed teeth, are frequently fractured by dentists in attempts at extracting teeth in close proximity to the diseased section.

The symptoms indicating fracture of the lower jaw are plain and unmistakable. The objective symptoms are abnormal mobility, and usually more or less deformity; and in connection with these conditions are crepitus, pain, an abnormal flow of saliva, difficulty in talking, and if the injury extends into the soft structures there will be quite a free hemorrhage. In crushing injuries there may be overlapping of the fragments. Abscesses frequently form after fracture of the ramus of the jaw, especially where there has been much blood and serum escaped into the surrounding tissues, and from the presence of detached splinters of bone.

Devoid of complications, fractures of the jaw ordinarily heal in from twenty-five to thirty days after adjustment, and in severe cases, where there has been extensive splintering of the bone, with loss of soft tissue, recovery has taken place rapidly and without deformity.
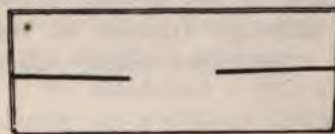
Fig. 96.—Method of making a pasteboard splint for treatment of fracture of the inferior maxillary.

Fig. 97.—The splint fashioned to fit the chin, first being moistened.

Treatment: The reduction of common fractures of the lower jaw is usually accomplished by manipulative procedures with the thumb and fingers, without resorting to operative measures. After the fractured fragments have been replaced, it is good treatment to immobilize the lower jaw by an improvised splint, made of pasteboard as represented in the accompanying cut, and bind it to the upper jaw with a few turns of a bandage two inches wide. The pasteboard splint is made by splitting up the middle, from each end to within an inch or so of the center, of a piece of pasteboard six to eight inches long and about four inches wide. The splint is then dipped in warm water, to render it pliable, and to prevent its breaking while being moulded into the form represented in the cut. When side should be padded with cotton, and adj

Fig. 98.—Splint applied, and bandage adjusted to hold it in place. (*Howe.*)

held in place by the bandage above referred to. Fractures through the body of the jaw, after once adjusted, are rigidly held in apposition by wiring together the teeth on either side of the fracture, as shown in the cut. Compound fractures, followed by suppuration require a free use of the alkaline

Fig. 99.—Treatment of fracture of the inferior maxillary by wiring the teeth with silver wire, as shown in the illustration. (*Howe.*)

antiseptics that the wounded surfaces be kept free from infection and resulting inflammation. Mouth washes containing alkaline disinfectants should also be used freely when it is possible to use them.

dyloid and coronoid processes,
ower jaw against the upper

by bandaging, after the fragments have first been adjusted by pressing them into place with the fingers.

Many cases are on record where, from delayed union, something akin to a false joint is established between the fractured surfaces. To overcome this defect the fractured surfaces should be cut down upon and freshened, and joined together by wiring.

In cases where it becomes necessary to keep the lower jaw immobilized against the upper for any length of time, the patient can be fed by the rectum, or through a rubber tube introduced through the nose, or between the teeth, if one or more have been lost, or passed behind the last molar tooth.

FRACTURE OF THE HYOID BONE

Notwithstanding the non-exposed position of the hyoid bone, it is occasionally fractured by direct force received from falls, kicks, blows, grasping the bone violently, and by the rope in hanging. Owing to the horse-shoe shape of the bone, the extending branches are more frequently fractured than the body of the bone.

The symptoms of fracture of the cornua are pain, swelling, crepitus, and abnormal mobility of the fragments. The pain is increased by pressure, and in efforts to swallow or speak. If the mucous membrane be punctured or lacerated by the broken fragments there is more or less hemorrhage following the injury. Ecchymosis soon follows the injury, causing a marked discoloration of the neck adjacent to the injury. If there is marked displacement, it is readily determined by the finger passed carefully back and to the side of the root of the tongue. Not infrequently the injury provokes an irritating cough, attended by dyspnea, and the raising of bloody mucus. The force causing fracture of the hyoid bone may be severe enough to lacerate the adjacent soft structures, and fracture the larynx, which may provoke death by suffocation.

Treatment: The reduction of any displacement following fracture of the hyoid bone may be easily accomplished by pressure with the finger, carefully introduced into the pharynx back of the tongue. The surgeon will, of necessity, have to execute

the manipulative work rapidly, to prevent suffocation and painful retching. Following the reduction, the patient should be enjoined from attempts at talking, and feeding may be necessary through an esophageal tube when there is a marked dysphagia. Much relief will be given the painful state by the external application of cooling and anodyne lotions every two or three hours.

FRACTURE OF THE CARTILAGE OF THE LARYNX

Fracture of the cartilage of the larynx is not frequently met with, and when it does occur it often endangers life by suffocation. The causes are grasping force displayed in efforts at strangulation, falls, blows, and hanging by the neck. Respiration is markedly interfered with soon after the reception of the injury, caused by the extravasation of blood beneath the mucous membrane, or from a puffiness of the tissues from emphysema. The force that fractures the cartilages of the larynx also frequently tears the mucous membrane, giving rise to active hemorrhage. The neck often takes on a discoloration, causing a distorted appearance, and the voice is changed in tone. Paroxysms of cough frequently occur, the expectoration being blood or bloody mucus.

In many cases where the mucous membrane is severely lacerated, the emphysematous state becomes general about the neck and the upper part of the thorax. Abnormal mobility of the fragments may be determined by digital manipulation, and crepitus elicited. In less aggravated cases the prominent symptoms will disappear in a few days. and the patient soon recovers.

Treatment: Mild cases will recover under the influence of cooling and evaporating lotions, and enjoined quietude. The aggravated cases may demand surgical interference. Suffocative dyspnea often demands tracheotomy, which should be done at the first marked symptom of suffocation, lest a little delay may result in death. If external manipulation has failed to reduce the fracture, and tracheotomy is done, renewed efforts are to be made through the wound, with a suitable elevator, to adjust the fragments, which in experienced hands generally proves successful. Evaporating lotions soon reduce inflammatory states, and the emphysema soon subsides.

THE RESECTION OF THE SUPERIOR MAXILLARY BONE

The antrum of Highmore is a cavity of considerable size, lined with mucous membrane and situated in the interior of the superior maxillary bones communicating with the nasal cavity.

Abscess formations are apt to develop in the antrum as a result of an extension of inflammation from the root of a tooth or alveolar process and from diseases of the nose. During the collection of purulent matter the patient is feverish and restless and there is local pain and more or less swelling; when the head is held in certain positions pus will drain into the nose, once it becomes thin and fluid like. The face on the affected side becomes exceedingly sensitive and the eye protruding and red from the irritation and distension caused by the developing abscess.

The first aid to the patient by way of treatment is to evacuate the pus. This may be done by penetrating the antrum through the alveolar process after a tooth has been extracted, or through a penetrating wound made from within the mouth and it is possible to make a counter opening into the nasal cavity. Whichever one of these courses is followed the success of the operative work will depend upon thorough drainage of the antrum cavity.

The cavity of the antrum is often the seat of malignant and other tumors which distort the face during their development. The color of the integument overlying the morbid mass is changed from a pinkish hue to a purplish or maroon color. The osseous tissue becomes softened and soon gives way to the texture cells peculiar to the developing growth. The cavity soon becomes filled with a soft pulpy mass that may later break down under the devitalizing force of the disease. If the nature of these developing growths is not determined early and the morbid mass removed, the disease spreads to adjacent tissue, especially to the ethmoid and sphenoid bones resulting in their early destruction, by decomposing pressure.

As before remarked the diagnostic features of the malignant disease are local pain, discoloration of the overlying soft parts, and distortion of the features of the face.

Treatment. The treatment of this morbid condition is pure-ly surgical and consists in removing the entire superior max-illary bone as soon as the nature of the developing tumor is determined. The successsive steps of the operation, which is usually a bloody one, is briefly as follows: After the surface of the face has been surgically prepared and the patient placed under the quieting influence of chloroform, the soft structures are divided with a scalpel along lines advised by Ferguson as follows: The upper lip is divided in the median line, the incision extending along the side of the nose to a point with-in about one inch of the inner canthus, thence across the upper part of the cheek along the line of the infra-orbital ridge fully three-quarters of an inch below the edge of the lid to the malar bone, thus avoiding the orbicularis muscle. The facial artery should be secured by ligature or by artery forceps as soon as it is divided when making the median lip incision, and it will be well to plug the posterior nares to prevent the blood entering the throat while executing the operative work. The flap constituting the soft structures is now dissected free from the superior maxillary out-ward as far as the malar bone above and to the tuberosity of the bone below, controlling all bleeding points as the vessels are severed by pressure, ligature, or forceps. Less hemorrhage is met with if the nasal cartilage and other soft structures are divided with strong scissors. The nasal cartilage should be divided close to the bone and pressed into the nasal cavity, and the periosteum freed from the bone near the orbit with the knife and periosteotome and pushed upward beyond the line at which the maxilla is to be divided. The malar process is next divided with bone cutting forceps aided when necessary with a small saw, commencing at the spheno-maxillary fissure, cutting forward and inward to the nasal cavity. The next step in the operative procedure is to divide the mucous membrane transversely from the median line across the hard palate on a line with its junction with the soft palate opposite the last molar tooth, next divide the mucous membrane in the median line from the inner extremity of the transverse incision forward to the teeth in front, and to prevent tearing the mucous membrane along the nasal septum, it had better be divided from behind forward along the line it is to be separated from that body.

The hard palate is then divided with chisel, saw, and bone forceps along the lines of the division of the mucous membrane. After most of the bony structure has been divided, the body is seized with forceps and pressed inward and from side to side breaking up all bony attachments not yet severed, and then pulled outward separating the bony mass from its posterior muscular connections. In wrenching the bony mass from its attachments much blood is lost but not in dangerous quantities; the hemorrhagic flow can be held in check by pressing a swab of lint or cotton batting wet in twenty-five per cent solution of adrenalin chloride or some other reliable styptic into the depths of the open wound. With the flow of blood checked and all shreds of soft structures and splinters of bone removed the flap is turned back into position and fixed with the necessary number of catgut sutures. Subsequent drainage is free into the mouth, and the disfigurement is not as pronounced as would be expected owing to the nature of the operation.

Through the mouth the traumatism should be kept free from pus and other discharges with the alkaline solution used with a syringe and the consequent swelling of the soft parts subdued with witch hazel and water or some other potent cooling lotion topically applied. Feverish states are held in check with aconite or veratrum combined with such other medicinal agents as may be indicated. The following mixture is of service in traumatisms of this nature:

R.
Spc. Tr. Veratrum .... gtt. xx
Spc Tr. Arnica .... ℥ss
Spc. Tr. Echinacea .... ℥ij
Aq. Menthæ pip., q. s. ....fl ℥iv
M. Sig.—A teaspoonful every hour or two as may be needed.

In cases where the malignant disease is limited in its destructive effect a goodly portion of the hard palate, if not all, may be saved. The rule is to save as much of the osseous structures about the mouth as possible without leaving behind infected tissue endangering a return of the morbid state.

While recuperating the patient should lie with the head elevated to prevent discharges from entering the throat; the mouth can be freed from foul smelling fluids by frequent rinsing of the buccal cavity with weak solutions of warm salt or borax

water to which a few drops of tincture of cinnamon or cloves
have been added.

The nourishment must be fluid in character and prepared
as appetizing as possible. If for the first few days it cannot be
taken by mouth, the patient may be fed through a stomach tube
or per rectum. As soon as possible the patient should be per-
mitted to exercise in the open air.

Polypoid and other benign growths may be removed by
opening up the antrum externally after the flap of soft structures
has been reflected back as previously advised. The nature of
the growths can usually be determined macroscopically. Drain-
age can be established through the nose or the alveolar process
following the removal of the growths.

STENOSIS OF LARYNX

Stenosis, or stricture of the larynx, frequently follows ulcera-
tion, which is generally due to syphilis or tuberculosis. The
morbid condition is frequently met with in general practice.
The vocal chords are the usual site for a tuberculous ulcer to
make its appearance, while the syphilitic sore generally shows
first as a gummatous affection of the epiglottis from which it
frequently spreads to the surrounding tissues.

Tumors forming in or about the larynx are a common cause
of stenosis, as is abscess or aneurysm of vessels in or near that
organ.

The characteristic symptoms accompanying stenosis of the
larynx is the difficult breathing (dyspnea), and in some cases
difficult deglutition.

The treatment of laryngeal stenosis is entirely surgical;
tumors, if present, should be removed and abscesses evacuated.
To give temporary relief, intubation may be done when feasible,
otherwise tracheotomy should be resorted to.

GLOSSITIS

Inflammation of the tongue is commonly met with in every-
day practice and is observed in different degrees of severity.

There are several varieties of the affection recognized by professional men each being produced by different causes. The superficial form of the disease follows scalds and burns and other traumatic injuries; the **deep seated** form is produced by the use of mineral poisons or follows an attack of severe systemic disease; the **papilliform** variety is noted in severe attacks of syphilis.

The symptoms accompanying attacks of glossitis will vary in accordance with the cause producing it. In simple attacks there is irritation of the mucous membrane with redness and swelling of the same; the sense of taste is impaired and the flow of saliva increased. The drinking of warm or sweet fluids increases the distress.

The deep seated variety is attended with symptoms much more grave than those mentioned in the simple form of the morbid condition. The inflammatory action destroys tissue, the tongue swells, patches of mucous membrane become detached and abscesses within the organ frequently form. In marked cases the mouth can with difficulty be closed; the breath is fetid and mastication and deglutition are accomplished with difficulty, the voice is muffled and pain is often distressing; rigors and hectic fever not infrequently supervene and the patient becomes restless and sleep is greatly interfered with.

The induration and swelling noted in the papilliform variety of the disease are mostly at the base of the tongue, there is present dull pain which is aggravated by mastication, and the swallowing of food is accomplished with difficulty. The papillæ at the base of the tongue are usually enlarged and tender, and the breath is foul.

Treatment. This morbid condition of the tongue is interesting to the surgeon from the fact that grave cases often present phases that require a resort to operative measures to give relief and start the patient on the road to a cure; the superficial varieties soon yield to the remedial action of aconite, phytolacca, rhus tox, hydrastis, and a mouth wash of some potent alkaline antiseptic; borate of soda, boric acid, and the alkaline mixture well diluted will answer the purpose well. During the time the patient is under treatment the diet should

be composed of bland articles of food, mostly if not entirely fluid.

The papilliform form of disease will not readily yield to the action of local remedies alone as the morbid action is the result of systemic infection in most cases. The primary cause should be first removed or at least should be medicated, while the local manifestations are being treated as the individual case may require. Penciling the elevated and indurated papillæ with sulph. of copper once every day or two at the outset of the treatment will prove of great benefit, following with the alkaline antiseptics mentioned in the simple variety.

The treatment of the deep seated form of the disease will of necessity have to be more vigorous to relieve the serious conditions that suddenly supervene in aggravated cases. The internal remedies mentioned in the simple form of the disease may be of much benefit here, but in connection the bowels should be actively moved with some one of the saline mixtures. Tr. of iodine painted on the neck just beneath the lower jaw on either side and followed with fomentation of hops and stramonium leaves wet with vinegar and water will prove beneficial. Bits of ice held in the mouth when possible will relieve thirst and prove comforting.

In grave cases where the swelling of the tongue is likely to asphyxiate the patient, try scarifying the sides of the tongue with a sharp bistoury, if this does not afford relief, tracheotomy may have to be resorted to, to save the life of the patient Nourishment is given by rectal feeding in most cases, however if this is objected to by a too sensitive individual, fluid food may be put into the stomach through a moderate size flexible tube or catheter introduced through the nares and esophagus. Small doses of strychnia may be given hypodermically every three or four hours during the day to counteract depression and prevent collapse.

Remedies that are indicated but cannot be swallowed may be applied upon the skin surface in the axillary region or in the groin, or administered per rectum. Complications must be met as they arise.

TONGUE-TIE

The shortening of the cord-like frenum situated beneath the end of the tongue, or the extension of it to the end of the tip of the muscular organ, is a congenital defect that markedly interferes with the child nursing. If the defect is not remedied in early life, a marked impediment in the speech is noted in some cases when the child arrives at the age that it commences to talk.

Treatment: To overcome the defect the frenum should be cut from before backward, with sharp cutting scissors, while the mouth is held open and the tongue elevated with a fenestrated groove director. A mouth-gag is usually required in young children. The operation is not very painful, and but little hemorrhage is encountered unless the ranine artery should be severed, an accident that can only occur by extending the incision too far back. Should such an accident occur, the bleeding vessel should be caught up with a sharp-pointed hemostat and pinched or twisted.

TUMORS OF THE PHARYNX

The pharynx is frequently the seat of morbid growths, both benign and malignant. Of the former variety, fibromata are perhaps the most frequently met with, although papillomata are quite common and polypoid growths are sometimes observed. These growths seldom give much trouble until their size blocks the passage way to the esophagus and trachea.

Epithelioma is the most common form of malignant disease of the pharynx and either commences at the base of the tongue or on the margins of the fauces.

The most serious results arise from the malignant disease after extension of the lesion to the larynx or esophagus, there causing obstruction.

There is more or less of a gnawing pain accompanying the disease, but the most serious condition complained of is dysphagia, which grows gradually worse as the disease progresses. As the disease encroaches upon the larynx there is more or less

dyspnea, and besides the voice becomes changed in character and is finally lost altogether.

Treatment. The treatment of the benign growths is by excision when they are accessible through the mouth and by external esophagotomy when the tumor extends well down into the throat.

In removing malignant growths of the pharynx. which if attempted, should be done most thoroughly: deep lymphatics should be dissected out at the. same time. else a speedy return of the disease may be looked for.

The extensive operative procedures required for the successful removal of tumors of the pharynx are fraught with great danger to the life of the patient, hence should not be undertaken except as a last resort and then only after the surgeon has acquainted himself with every detail of the operation and the anatomy of the part involved.

TUMORS OF THE ESOPHAGUS

Tumors both benign and malignant originate in the eso- phagus. Polypi, cysts, myomata and papillomata constitute the benign variety usually met with, while carcinoma and sarcoma' of the tube are frequently observed in surgical practice. Either form of the morbid growths constitutes a serious lesion of the muscular tube, and one that taxes the operative skill of the surgeon to relieve.

The benign growth gives little evidence of its presence in the tube until its size blocks the lumen of the tube, when a reasonably positive diagnosis may be obtained by the use of an esophageal bougie or esophagoscope. There are seldom if ever any diagnostic symptoms attending the morbid state other than the difficulty experienced by the patient in swallowing fluids or food.

Sarcoma of the esophagus usually attacks the lower portion of the tube and runs a rapid course and generally terminates fatally.

Carcinoma of the esophagus, like sarcoma, is very likely to attack the lower three inches of the muscular tube. Epithelioma

quite frequently attacks the upper portion of the esophagus extending through the continuity of structure from the pharynx, usually the primary seat of the disease. Stenosis soon occurs at some point in the tube as the result of the infiltration, making deglutition progressively difficult. Added to the dysphagia there is generally a boring pain experienced through the chest and distress of greater or less intensity experienced between the shoulder-blades. As the disease advances the appetite wanes, the patient complains of physical weakness, a cachectic look overshadows the features and he gradually lapses into a state of prostration. When the cancer is located in the lower end of the esophagus, it gradually extends to and involves the walls of the stomach, giving rise to digestive disturbances, more or less pain, and an exceedingly foul breath.

When the diagnosis of tumor of the esophagus is positively made it will preclude the thought at once of trying to give relief of the morbid condition by the administration of medicinal agents outside of those given to subdue pain. If the growth is polypoid in nature and located in the tube where it can be approached, it may be possible to remove it with a snare, or by excision or cautery, after opening the tube (esophagotomy), if it is found in the upper part of the esophagus.

In cases of malignancy little need be expected in the line of cure from any form of treatment. Skillful surgeons, in the past, have removed the cancerous growth together with a portion of the esophagus only to have the disease return in some part of the nearby tissues. During the period that the disease was recurring the patient was kept alive by feeding through an artificial opening into the stomach, a **gastrostomy** being executed. The author has no knowledge of a cure having followed operative measures for the removal of a malignant growth of the gullet.

If an attempt is made to remove a growth in the lower portion of the tube it will be possible to approach it from behind the mediastinum while the lungs are kept in an expanded condition by the Sauerbruch cabinet or some other artificial means equally efficient.

In the early stages of the malignant disease of the esophagus, where, for any reason, operative procedures are contraindicated

or refused, the author would suggest that the patient be given in alternation the following remedial agents which not only retard the progress of the disease in a measure, but sustain, to a great extent, the vital energy of the patient: Spc. Tr. thuja, hydrastis, echinacea, phytolacca, Fowler's solution of arsenic, arsenite of strychina, and Abbott's two drop neulin tablets.

TUMORS OF THE LARYNX

Fibrous growths, papillomata and epitheliomata are quite commonly found in the larynx. The two former varieties usually originate on or near the vocal cords, while the malignant growth is generally an extension of the disease from the pharynx or other nearby structures. The fibroma is usually found pedunculated while the papilloma occurs as a fringe or wart-like mass which may also be pedunculated. This form of growth may cover over a considerable of the surface of the vocal cords and adjacent structures but shows no tendency to infiltrate the adjacent tissues. These benign growths are encountered in persons of all ages but are most common in adult life.

Epitheliomata are most commonly met with in individuals after middle age and cause more or less infiltration of surrounding tissues. The morbid action develops rapidly when secondary to pharyngeal cancer, soon eventuating in dyspnea and change of voice. Cough is a troublesome feature of the disease in every case. A microscopic examination of a specimen removed from the diseased area will confirm the diagnosis of the suspected disease.

Fibromata of the larynx should be removed by excision; if accessible, through the mouth, otherwise a laryngotomy will have to be resorted to. Papillomata if not too large can be removed by the application of caustics. Chromic acid applied on a wooden applicator is an efficient agent for the destruction of this form of tumor when accessible. They may be removed by cutting forceps, fashioned for the purpose by an adept in the use of the instrument, and the laryngoscope.

Epithelioma cannot be removed by other than surgical means, which should be resorted to in time to prevent if possible in-

filtration of the surrounding tissues and a metastasis of the disease to adjacent parts. If the disease is far advanced a thorough removal of the cervical lymphatics should be done at the time the growth is removed.

The general health should be looked after during the time the patient is under treatment. Peptics, tonics and stimulants should be prescribed with good food and exercise in the open air when the patient's condition will permit of it.

Following the operative measures the patient will have to be nourished by rectal feeding, making use of such fluid foods as seem best suited to the individual case.

THYROIDECTOMY

The removal of a portion or all of the thyroid gland is done when required to give relief from pressure caused by its morbid growth.

The gland often takes on a morbid growth (goitre) caused by inflammatory action resulting from low grades of infectious fevers as typhus, typhoid and other systemic derangements, as anemia, chlorosis and the taint of hereditary disease. The growth is usually slow and may appear principally on one side although it generally shows equally on both. It is an affection more frequently observed in women than in men, appearing between the ages of eighteen and thirty.

The removal of the gland is resorted to after all medicinal means have failed to reduce it, and is done as follows; after the the surface of the neck has been rendered aseptic and the patient chloroformed, a transverse or a vertical incision of the required length should be made, the middle of which should correspond with a point over the center of the neck. This incision should divide skin, fat, and fascia, down to the muscles of the neck. The divided structures are well retracted with blunt hooks exposing the attenuated muscles which are divided as may be found necessary; these held back out of the way will expose the enlarged gland. After all bleeding vessels are secured the main thyroid arteries and veins passing into the gland above and below are sought, and if found, they should be secured by liga-

ture, after which the gland should be dislocated forward if possible, first one half and then the other. Except in malignant disease a portion of each lateral lobe should be saved, by passing around or through the gland structure a strand of silver wire which should be drawn tightly and secured by twisting. When cutting through the gland all bleeding vessels should be clamped at once to avoid extensive loss of blood.

In malignant disease the entire glandular structure should be dissected out in all cases where this is practicable. For several reasons the operation for the removal of a goitre is fraught with danger. The operation is difficult of execution, owing to the intricate structures encountered during the work; besides the distressing embarrassment the patient labors under, on account of the difficult breathing. makes the giving of a general anæsthetic extremely dangerous in some cases.

On account of the involvement of the deep structures of the neck. very few cases of malignant disease of the thyroid gland, of some time standing,/are operable. In such cases only temporary benefit follows any measure resorted to for relief.

Division of the isthmus under cocaine anæsthesia for the relief of the pronounced dyspnea from pressure is sometimes resorted to in grave cases where the removal of any part of the gland is contraindicated. Most, if not all of the vessels encountered in operating for the removal of goitre should be divided between double ligatures. The wound following complete removal of the gland may require drainage for a few days. The skin margins should be accurately approximated and sutured with fine catgut and the wound dressed with sterile gauze.

TUMORS OF THE TONGUE

Of the morbid growths that are likely to find their origin on the tongue the papilloma and epithelioma are the most commonly met with. The former commences as a warty growth, and develops slowly, is not very painful and is not indurated at its base, a feature that distinguishes it from the malignant tubercle. Epithelioma usually forms at the end or sides of the tongue, appearing first as a small tubercle or warty excrescence

with a hardened base. It is very tender and painful, often rendering the tongue stiff and sore.

Vascular and fibrous tumors developing on the tongue are not uncommon, and often assume a considerable size. With the former is often associated a dilated state of the blood vessels of the tongue and throat, giving rise to a feeling of stiffness of the tongue in efforts to talk.

Cystic tumors sometimes form on the tongue in early life as a result of digestive disturbances, assuming the size of a small marble. Their development is slow and is as a rule painless.

Treatment. The treatment of cystic growths is by incision, and cauterization. The fibrous and cancerous tumor should be removed early by a V-shaped excision of the diseased part, followed by joining the margins of the flaps with sterile catgut, thus closing the gap. In cases of malignancy where the tongue is extensively involved, most of the organ should be excised. When the case presenting makes it practicable the methods of Whitehead and Langenbeck should be followed. Whitehead advises the placing of a retention suture through the end of the tongue upon which traction is made. The tongue is divided transversely by snipping with scissors at the point selected back of the diseased portion, picking up the bleeding vessels as they are brought into view and ligating them with catgut or silk; or the lingual arteries may be ligated previous to severing the tongue thereby lessening the amount of hemorrhage perceptibly. In cases where the tongue is extensively involved by the cancerous growth, a previous tracheotomy should be done to obviate the complication of lung trouble, during and following the operative work.

Following the operative procedure the mouth should be washed out frequently with the alkaline solution so often referred to throughout this work. The packing of the wound with sterile gauze is necessary in but few hemorrhagic cases.

The method of Langenbeck differs from Whitehead's operation mostly in the preliminary steps, especially in ligating each lateral half of the tongue with silk or heavy catgut back of that portion of the tongue necessary to be removed. These ligatures are passed with a medium curved needle which is entered near the median line and made to transfix the organ, com-

ing out on the side, and then made to include a small bite in the edge of the tongue to prevent slipping after amputation. Another ligature is passed on the opposite side in a similar manner and securely tied. The ends should be left long that they may be used as traction cords to pull the tongue forward before amputating it.

The portion of the tongue to be removed is seized with tenaculum forceps and cut away by a V-shaped incision with scissors or a blunt pointed bistoury, being careful not to wound the blood vessels lying deep in the floor of the mouth. The ends of the severed vessels are picked up and ligated and the margins of the incision in the tongue approximated and secured with catgut sutures.

The morbid state of the tongue may require the removal of only one side of the organ, which is quickly done as follows; a traction suture is placed on either side of the median line near the tip: by the aid of these strands the tongue is pulled forward. The frenum is next severed with scissors and the tongue freed from its under attachments by blunt dissection with scissors and the end of the finger, back as far as the diseased condition requires. The tongue is then split in the median line from before backward as far as necessary when the diseased lateral half is cut away by a transverse section with scissors. The wound is kept clean with frequent rinsing with antiseptic washes and the food taken in fluid form through a stomach tube or by rectal enema.

For complete removal of the tongue, Whitehead's method offers decided advantages over some others that are advocated by way of easy technic. As a preliminary step he cuts down upon and ligates the lingual artery on either side of the neck, after the face and neck have been rendered thoroughly aseptic. If the submaxillary glands show infection, they may be removed through the incision as may lymphatic glands and other morbid tissue appearing near the wound. These incisions are then closed with catgut sutures, a small piece of gauze being placed over the wound and all sealed in with sterile collodion.

The patient's head is then placed in such a position that the head inclines a little forward to permit of an easy escape

of blood and other fluids while executing the remainder of the work.

The jaws should be held apart with a mouth-gag and a braided silk ligature inserted through the end of the tongue a half inch or more from the tip. By making traction on this strand outward and upward, the frenum and other attachments under the sides of the posterior portion of the tongue, are dissected free with the blunt scissors and the end of the finger. The base of the tongue is then cut across with repeated snips of the scissors on a line with the lower border of the inferior maxillary and as far back as the safety of the amputation will allow without injury to the epiglottis. In many cases the use of a bistoury will be required to aid in the amputation of the tongue although less hemorrhage follows the use of the scissors.

After the removal of the tongue the bleeding ends of the dorsalis vessels should be secured with artery forceps, clamped and twisted or ligated, as the necessity of the case will decide. If the retraction of the stump renders the securing of these vessels difficult, it may be brought forward well into view with a tenaculum.

The after treatment consists in frequent washings of the mouth with antiseptic solutions, and controlling pain during the first few hours following the operation with small doses of heroin, hypodermically administered. Fluid nourishment is given every five or six hours through the stomach-tube or by rectal enema, or by both methods. If rectal feeding is the course mostly followed special care should be exercised to prevent irritation of the rectal pouch by the tube or undigestible fluids. Before food is given per rectum the bowel should be cleared from mucus and feces that absorption will not be interfered with. Weak borate of soda, or saline solutions, are the best for cleansing purposes and besides they are antiseptic in nature. The several kinds of food and their proper preparation for rectal feeding are fully described under the heading of "Rectal Feeding," to which the reader is referred.

NOMA—CANCRUM ORIS

Some of the eruptive diseases are frequently followed by an attack of stomatitis very severe in character; in fact the morbid state often approaches the degree of gangrenous degeneration. Children between the ages of six months and two years are the most liable to these attacks, and those of a strumous habit of the body suffer from the worst form of the affection.

The disease usually commences in the form of a small inflamed ulcer either on the gums or the inside of the cheek; the tissues immediately surrounding it, soon become swollen, edematous, tender to the touch, with a tendency to spread rapidly to adjacent parts, often producing sloughing and perforation of the cheek accompanied with symptoms of septic fever, manifested by a red tongue, coated brown, or the tongue may be found broad and pallid, covered with a pasty grayish fur indicating the gravest form of stomach and intestinal indigestion.

The breath is very offensive, being of a putrid and gangrenous odor, and the saliva soon becomes profuse and very acrid in character. When the gums are the seat of the disease a considerable portion of the affected area becomes necrotic and sloughs away.

The disease has a bacterial origin and children living in squalor are the most liable to attacks of it. The systemic infection makes rapid inroads upon the strength of the patient who, not infrequently, soon collapse from general exhaustion. Cases less severe in character may linger along two or three weeks or more, but will finally yield to the ravages of the disease as a rule. The most prominent symptoms of the general septic invasion are hectic fever, vomiting and foul smelling alvine discharges.

Treatment. The treatment consists of both local and general measures. Locally the sore parts should be cleansed with the alkaline mixture, full strength, or diluted to meet the requirements of the individual case. The mouth should be washed with a weak solution of the same or one-half of a one per cent solution of permanganate of potassium. Cases threatened with rapid disintegration should be touched up with the following mixture:

℞.
  Salicylic Acid .... gr. xx
  Biborate Soda .... gr. xxiv
  Glycerine ....fl. ℥j
  M. Sig.—After cleansing, touch the ulcers lightly four or five
  times a day, especially after feeding.

It is a common practice to remove with a sharp curette, the necrotic tissue, following with cauterizing the traumatic area with chloride of zinc or nitric acid, either of which should be used very cautiously. The sensation of the raw ulcer may be deadened with cocaine before the caustic is applied, care being taken not to allow the child to swallow much of the lethal agent.

Internally the child should have liberal doses of spec. tr. echinacea or baptisia combined with phytolacca, hydrastis, ipecac or other indicated remedies. Small doses of Fowler's solution of arsenic should be given every three hours during the day, which can be combined, to good effect, with a few drops of syrup of lime or the elixir of the glycero-phosphate of lime and soda. The spec. tr. of phosphorus is not without benefit in these cases and the albuminate of iron is indicated in anemic states.

If sufficient nourishment cannot be taken by mouth, rectal feeding should be resorted to. Olive oil containing quinine should be rubbed on the body once or twice a day and the temperature kept normal with proper clothing.

This morbid disease may attack the genitals of children resulting in ulceration as destructive in character as when it attacks the tissues of the mouth. Noma pudenda, the name by which the disease is known when located about the pudendal region, may appear at the same time that it shows in the mouth, and is accompanied with about the same symptoms. The ulcer and adjacent parts are inflamed and painful, soon followed by edema, a purulent discharge and gangrene. The fetor is very offensive and the child suffers from septic infection, and sinks under great physical exhaustion.

The treatment will be the same as advised in gangrenous stomatitis.

ODONTOMATA

Odontomata is an exostosis or osseous growth found about the root or body of one or more of the teeth and may occur in either jaw. Another form of growth, cystic in nature and sometimes containing a dark fluid, is also observed in connection with the teeth.

Other tumefactions composed of the character of the tissue from which they spring are occasionally observed near the margins of the alveolar process; thus there may exist a fibrous growth which springs from the fibrous sheath surrounding an erupting tooth, which may in a measure interfere with its development. A follicular tumor originates in a morbid tooth follicle and if it contains elements of dentine and other constituents of the tooth together with rudiments of teeth, it is sometimes called compound follicular tumor.

When these growths originate in or near the antrum they often attain a considerable size. The patient suffers distress and pressure pain during the development of these growths and the disfigurement of the jaw is a marked feature in many cases.

Treatment. The treatment is entirely surgical, the growths being removed with bone-cutting forceps or chisel after the soft structures are incised and reflected back exposing the diseased area. In the cystic variety the cavities are opened up, curetted, or cauterized with pure phenic acid, packed for twenty-four hours and dressed antiseptically.

PHARYNGOTOMY

The pharynx is opened through a lateral incision in the neck for removal of tumors and foreign bodies.

There are several methods of performing the operation but Cheever's is the one usually adopted on account of the comparatively easy steps in its execution. The technic is here briefly given; after the patient has been prepared in the usual manner, an incision is made along the anterior border of the sterno-mastoid muscle, extending from the lobule of the ear to a point op-

posite the cornu of the thyroid cartilage through the
skin, fat, and fascia down to the deep fascia of the neck; by re-
tracting the margins of the wound the external jugular and
temporal and facial veins are exposed, after dividing the deep
fascia which should be done with the point of a grooved director.
These vessels should be divided between a double ligature after
which the carotid arteries and deep jugular vein, together with
the loose surrounding tissue are pulled to the outer side with
a small blunt retractor. If the digastric, styloid, styloglossus
and stylopharyngeus muscles cannot be sufficiently retracted to
expose the pharynx beneath, they should be divided upon a
grooved director avoiding the hypoglossal, glossopharyngeal
and lower branches of the facial nerve in executing the work.
The pharynx may now be made to appear in the incised opening
by forcing it outward with a sound or metal catheter, introduced
through the mouth where it is opened, and any further work
done that the nature of the case may require; this done and all
bleeding points picked up and secured, the wound in the pharyn-
geal wall should be firmly closed with a double row of iron dyed
silk. The overlying soft structures are next united with cat-
gut sutures and the wound in the skin with a buried silk-worm-
gut suture. The external wound is then cleansed and dressed
with sterile gauze pads which are held in place with a few turns
of a spiral bandage.

INTUBATION OF THE LARYNX

Intubation of the larynx is executed to relieve distressed
cases of dyspnea from whatever cause.

The operation is resorted to for relief from the dyspnea
accompanying diphtheria more frequently than for any other
morbid condition. The success attending the operation is not,
in every instance what the surgeon and individuals near to the
patient would wish it to be; this can be accounted for however
by the fact that the operation is done in nearly every instance
in an emergency and often on patients living in the most
wretched squalor, and in stages of the disease where the phys-
ical powers of the system are well nigh exhausted.

The operation provides for the introduction of a gutta-percha or metal tube, fashioned with a flange at the upper end, to rest upon the false cords of the larynx when inserted within the lumen of the organ.

To execute this work a set of instruments specially made for the placing of the tube will be required; these consist of a tube and contractor, introducer and extractor, and besides these

Fig. 100.—O'Dwyer's instruments for intubation: *a*, mouth gag; *b*, *c*, tubes; *d*, intubator; *e*, extubator.

a mouth-gag, and a spool of rather heavy silk cord should be added, the former to hold the jaws apart and from the latter a silk strand is provided which is fastened to the upper end of the tube before attempting to introduce it, to prevent pushing it through the larynx into the trachea.

Unless the patient is unusually refractory no anæsthetic will be required, otherwise chloroform should be given just sufficient to produce mild narcosis.

The child should be held on the lap of an assistant with its head resting against his breast and a sheet well pinned about its neck. The mouth-gag should now be placed between the teeth as

far back as is convenient and the jaws pried apart ; the tube which has previously been fastened to the end of the introducer is then directed into the pharynx and downward and a little forward into the laryngeal entrance by elevating the handle of the introducer. After the point of the tube has entered the glottis it is pushed free from the introducer by pressing the end of a lever that rests along the side of the instrument, then, as an aid to pushing the tube into position, the forefinger of the left hand is introduced into the pharynx and coming in contact with the upper end of the tube it is forced downward while the silk

Fig. 101.—The position assumed by the patient, in the arms of an assistant, during an intubation of the larynx. The mouth is held open with a mouth gag, by a second assistant.

cord is held tight with the right hand to prevent it being pushed beyond the glottis.

Without anæsthesia the introduction of the tube is attended with more or less of a struggle on the part of the patient but the operation is quite readily accomplished if the arms of the patient is secured within a folded sheet and the head firmly held by the assistant.

After the purpose has been accomplished for which the intubation was done the tube should be removed by introducing the extractor into the pharynx guiding the closed beak to the end of the tube with the end of the finger, when the jaws of the instrument are opened by pressing the lever which rests along the side of the handle with the thumb grasping at the same time the open end of the tube and withdrawing it.

The length of time it is required to leave the tube in place will depend largely upon the cause for which the operation was performed; it is generally removed in from two to five days.

When intubation is done for the relief in laryngeal diphtheria, breathing is made markedly easier at once upon the introduction of the tube through the glottis, unless a portion of detached membrane is pushed before the tube or otherwise occludes it; if this accident occurs the tube should be removed, cleansed and reinserted.

Upon placing the tube within the folds of the glottis it will be well to retain the silken cord in place for a few minutes or until the presence of the tube ceases to excite irritation and cough, it then can be removed by cutting the loop on one side, t then being pulled away by making careful traction on the other nd.

During the time that the tube is in place the patient should be given fluid nourishment per rectum or through a large soft atheter inserted through the nose into the stomach. Hoarseless and cough generally remains some days subsequent to the emoval of the tube which can be relieved in most cases by the administration of a drop of stalingia liniment on a little sugar or one-thirtieth grain of heroin in sugar of milk.

EDEMA OF THE LARYNX

Edema of the larynx is an acute inflammation of the mucous membrane of that organ as well as that of the vocal chords, accompained with an infiltration of the areolar tissues surrounding these parts with mostly serous fluid. The characteristic features of the morbid condition are the difficult breathing and the marked change in the voice (dysphonia).

The etiological factors to be considered in connection with this disease are acute inflammation, abscess formations in or about the larynx, injuries resulting from external violence, infection resulting from constitutional diseases, as erysipelas, scarlatina, smallpox, syphilis and Bright's disease.

The symptoms accompanying edema of the larynx depend largely upon the exciting cause; when due to inflammation the onset is gradual; the patient experiences a sensation in the throat as if some foreign substance was obstructing respiration; the soft parts may advance to such a degree as to threaten suffocation. These symptoms develop more rapidly when the edema results from traumatism or infectious diseases; not only is respiration most difficult but the voice, at first husky, is frequently lost altogether. Cough, dry and harassing, is a troublesome feature in some cases. The patient is obliged to sit propped up in bed and often gasps for breath; the features wear an anxious look and often assume a cyanotic appearance, and death frequently ends the scene if prompt relief is not given either by remedial or surgical measures.

Treatment. The treatment of this distressing disease must of necessity be prompt and effective to relieve the puffy state of the tissues that gives rise to the marked dyspnea. In the early stages the patient should be put on small and frequent doses of aconite and apis alternated with apocynum or other indicated remedy. The inhalation of steam from witch hazel, one part to water three parts, directed into the throat through a funnel made of heavy paper will prove of decided benefit to the patient. A few drops of the solution of adrenalin chloride added to the above mixture will aid materially in reducing the local congestion. Small pieces of ice held much of the time in the mouth often aids in dissipating the local inflammation and swelling.

If after giving the above measures a fair trial, no relief is obtained, intubation or tracheotomy should be resorted to without delay; the technic of these operations are given under separate heads in another part of this work.

If conditions are favorable the interior of the larynx may be scarified to relieve the local congestion, this is best done with a sharp pointed curved bistoury the blade being wrapped with

gauze or cotton within an eighth of an inch of the point. In executing the work the point of the knife is directed to the larynx by the end of the index finger of the left hand.

Not infrequently the patient's strength needs to be sustained by stimulants applied to the surface of the body in the form of alcohol and quinine, or whisky and milk, administered per rectum once or twice a day in connection with peptonized milk or beef tea, moderately hot.

SPASM OF THE ESOPHAGUS

Spasm of the esophagus is occasionally met with in persons of a hysterical state of body. It is more frequently met with in women than in the male sex. The distressing state is often observed during attacks of tetanus, hysteria, and the convulsive stage of hydrophobia. To the observer, the symptoms of the morbid state simulate those of stricture of the muscular tube. The solicited history may bring out the fact that the esophagus had previously suffered injury from swallowing corrosive liquids or some kind of foreign body, producing more or less local injury usually in the lower portion of the tube. In such cases, the surgeon will have to differentiate, if possible, between the two conditions, that of true spasm of the muscles of the esophagus or stricture of the tube; this is generally very easily determined by the passing of a suitable sized bougie.

The symptoms of true muscular spasm of the esophagus are dysphagia or difficult swallowing which comes on periodically, with a feeling of constriction about the throat. There is seldom any difficulty in introducing a bougie.

Treatment: The treatment will have to be varied to meet the causes responsible for the abnormal condition. When due to a nervous or hysterical state of the body, nervines are indicated, here gelsemium, pulsatilla, platinum, valerian, ignatia, and asafœtida will prove curative if specifically indicated. Two of these agents may be combined or they may be given alternately to advantage.

If the morbid state be due to tetanus or follows an attack of hydrophobia, quick relief may be given by the inhalation of

amyl nitrate, chloroform or ether; later the constitutional ailment is to be treated with antiseptics, antispasmodics, stimulants and tonics, with such modifications in the dietary as the individual case will suggest.

STRICTURE OF THE ESOPHAGUS

The esophagus composed of muscular structure and invested on its inner surface with mucous membrane is liable to stricture as a result of traumatism, malignant disease, pressure from tumors developing near the muscular tube, goitre aneurysm, cicatricial contraction caused by drinking corrosive fluids, and syphilitic ulcers. When the morbid state is due to traumatism it usually results from efforts to extract foreign objects from the tube, gunshot wounds, or surgical operations.

Strictures due to any of the above causes should be differentiated from those produced by muscular spasm or paralysis. The contraction when due to hysterical causes is observed frequently in young nervous females, the attack occurring usually when the emotions of the patient are exercised. When due to paralysis a history of diphtheria can generally be elicited from the patient or friends. There are no marked symptoms observed when the contraction is due to the latter cause except that of slow and difficult deglutition, solid food seemingly, is more easily swallowed than fluids.

To determine that a given case is due to hysterical causes the patient should be placed under an anæsthetic and an attempt made to pass a bougie, the instrument is usually introduced without difficulty.

While pain and difficult deglutition are the symptomatic indications accompanying pronounced cases of stricture of the esophagus from whatever cause, it will require the attempt at introduction of the bougie to complete the diagnosis. Attempts at vomiting and regurgitation of food and gurgling sounds heard about the chest in attempts at swallowing fluids are common symptoms in stenosis of the tube.

A patient suffering from pronounced structure of the gullet soon becomes emaciated for the want of bodily nourishment,

which is extremely difficult to maintain from the small amount
of food the patient is able to swallow, which is mostly composed
of milk, thin soups, and the juices of meat and fruits. These
fluids if properly prepared may be administered per rectum to
sustain life for a time in serious cases.

Strictures due to traumatism will require the daily passage
of graduated bougies; these instruments will have to be used
with caution however in cases of contraction due to aneurysm,
but may be used with some relief in the early stages of cancer.

Internal esophagotomy will have to be resorted to in grave
cases to preserve life, especially when the stenosis is high up
in the tube; the character of the operation and the structures
involved practically resolves the surgical procedure into that of
a gastrostomy.
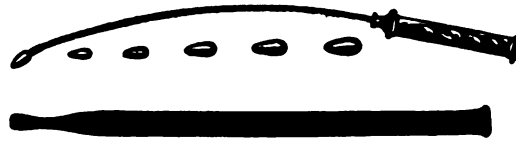
Fig. 102.—Esophageal dilating bougies.

The patient prepared in the usual way and anæsthetized,
an incision five inches in length is made over the stomach an
inch or more internal to, and parallel with the free border of
the ribs on the left side; after reaching the abdominal cavity
the edges of the wound are held apart with blunt retractors.
In searching for the stomach care should be taken not to mis-
take the transverse colon for that organ as it lies below and
close to the greater curvature. A portion of the anterior wall
of the stomach is seized with the thumb and finger of the left
hand and brought out through the abdominal incision and sterile
gauze pads packed around it to protect the peritoneal cavity
from becoming soiled as the operative work progresses. The
incision in the stomach should be two or three inches in length
and made in the long diameter. The stomach should then be
cleared of its contents, and all bleeding points secured with ar-
tery forceps or ligated with fine catgut. With the index finger
of the left hand introduced into the stomach the esophageal
orifice of the tube is located and a small bougie armed with a

strand of braided silk is forced through the structured portion
of the canal and made to appear either in the pharynx where
the end of the strand is seized with forceps, or through an in-
cision made in the side of the neck opening into the esophagus.
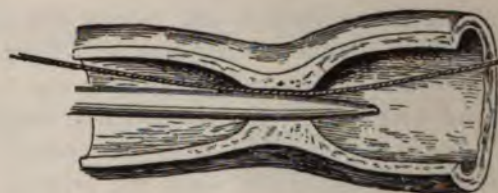
Fig. 103.—The cutting of the stricture, aided by the use of
an esophageal bougie. (*Da Costa.*)

The silk strand is left in the canal after the removal of the
bougie; it should be at least two feet long that the operator
may be able to secure a good hold at each end and enough slack
left to display a sawing motion through the stricture as repre-
sented in the accompanying cut. While this is being executed
Prof. Abbe advises that a conical bougie of suitable size be in-
troduced into the tube through the incision in the stomach and
made to dilate the contracted portion while it is being incised
by the friction of the silken cord. Little hemorrhage is pro-
voked by this method of procedure.

Fig. 104.—Abbe's method of operating on esophageal stric-
tures. (*Da Costa.*)

After the bougie and silk strand have been removed, a moderately firm rubber tube, a foot or more in length, is introduced into the esophagus past the strictured portion and left in position; the lower end of which should be extended through the stomach and out of the abdominal incision that it may be readily removed at a later date. Before attempting to close the abdominal wound the edges of the parietal peritoneum are joined to the margins of the skin with interrupted catgut sutures; next the edges of the incised wound in the stomach are united to the margins of the abdominal incision with numerous silk sutures adjusting the opening in the stomach about the end of the esophageal tube and a second rubber tube extending into the viscus through which fluid food may be introduced. The remaining part of the abdominal wound except that portion to which the stomach is sutured may be closed with chromicized catgut or silk-wormgut sutures.

The esophageal tube may be removed in a few days, the time depending upon the post-operative condition of the patient. Graduated bougies may be passed into the esophagus and through the strictured portion every few days if conditions warrant; later the rubber tube through which nourishment was supplied to the stomach should be removed, the edges of the open wound prepared and closed with silk-wormgut sutures.

It is best not to close the abdominal wound until there is no further trouble in the passage of the graduated bougies from above, this should be done every week or ten days over a period of several months after the closure of the wound to prevent subsequent contraction of the stricture.

External esophagotomy is done to relieve stricture of the gullet when the morbid condition is high up in the tube, also to remove foreign bodies that become lodged near the pharynx.

This operation is done under anæsthesia and the successive steps are as follows; the patient's head turned to the right, an ncision four or five inches in length is made along the inner iide of the inner border of the sterno-cleido-mastoid muscle, which should divide the skin, fascia, the platysma and the inervening cellular tissue. The location of the stricture or oreign body having been previously determined and with the :dges of the divided structures held apart with blunt retractors,

a long blunt pointed steel sound can be introduced into the upper part of the esophagus until it becomes engaged in the stricture and made to bulge that part of the gullet into the incised wound. The remainder of the dissection should be done with the finger and handle of the scalpel, care being taken not to rupture important blood vessels which should be drawn to one side with a blunt hook as they are encountered, or divided between two ligatures.

After dissecting the way down through the tissues the esophagus can be recognized as it is approached by its flat muscular appearance; when the portion made to bulge into the open wound upon the point of the sound is recognized, it should be opened with a bistoury, between toothed forceps and this opening enlarged if need be with scissors. After the stricture has been divided or given other necessary attention the opening in the gullet should be closed with catgut, the wound in the overlying soft structures packed with sterile gauze for a few days or until is it assured that the operative work done on the stricture will prove permanent; the wound is then closed by a plastic operation. If for any reason a permanent fistula through which nourishment is to be given, is required, the edges of the esophageal wound should be united to the corresponding margins of the cutaneous wound by interrupted catgut sutures the wound afterwards kept clean with antiseptic washes and gauze dressing.

Following the operative procedure the patient should be given nourishment per rectum or through a stomach tube as may best accommodate the invidual case for several days until the acute operative symptoms have passed away.

DIVERTICULA OF THE ESOPHAGUS

Diverticula of the esophagus, when pronounced, is a serious affection, owing to the difficulty experienced in swallowing and the gravity of the operations necessary for relief. The morbid state may be congenital or acquired; the former is seldom met with and the latter is generally due to a stricture of the tube or to a protrusion of the inner coat through a weakened portion of the muscular wall of the tube.

The symptoms noted in the affection are quite similar to those observed in stricture of the esophagus and from which the diverticulum should be differentiated. The accumulation and regurgitation of large quantities of mucus, and the difficulty experienced in swallowing (dysphagia) are characteristic of the affection. Naturally, coarse food cannot be swallowed, the patient being obliged to live on gruels, broths, soups, custards, rice and vegetables thoroughly masticated. If the pouch-like process is situated rather high up in the tube, a swelling is noted in the neck immediately following the attempt to swallow food. This is caused by the filling of the diverticulum and the dilated state of the tube at the site of the offshoot.

Treatment: The treatment of diverticula of the esophagus is by surgical means only. If a diverticulum is suspected, the same may be located by the use of a steel or whalebone sound with a tip of rubber which deviates to the right or left at the end. As the esophagus tube is some nine inches in length, the sound should be at least a foot longer to be of a convenient length to manipulate well. Several of these sounds with tips graduated in size should be at hand to aid in the diagnosis.

If a stricture of the tube is discovered, an attempt should first be made to dilate it with graduated bougies, if this does not bring relief, the constricted portion should be incised as directed in the article on **Stricture of the Esophagus.**

If a diverticulum is found to exist and its location is high in the tube, it can be exposed for treatment through an incision in the neck as made for œsophagotomy. If feasible, the pouch-like process should be excised and the stump closed with a Halstead or purse-string suture, as best suits the individual case. Chromicized cat-gut or iron-dyed silk may be used for suture material to close the esophageal wound. The external wound may be closed wtih catgut or silk-wormgut sutures, making provision for drainage if the nature of the case requires it.

If it is determined that the diverticulum is located in the dependent portion of the muscular tube and the patient's condition is distressing, it may be possible to reach the pouch-like process through an incision into the stomach.

Operations for the relief of the morbid condition are always serious, hence it behooves the surgeon to acquaint himself well with the anatomy of the region with which he has to deal before attempting to execute the work.

SALIVARY FISTULA

Traumatic injuries received along the course of Steno's duct often eventuate in a salivary fistula, the distal end of the duct opening upon the outer surface of the cheek through which saliva constantly flows, the amount being increased during mastication. Ulcerative diseases of the parotid gland and duct may also be a cause of the morbid state. The skin over which the saliva flows is kept in a state of irritation, besides, the appearance of the facial blemish is exceedingly objectionable.

The distal end of the duct can usually be directed into the mouth through a punctured incision made with a pointed bistoury directed from the inner side of the cheek, the procedure aided by a lead or silver wire introduced into the mouth of the duct from the inner side of the cheek which will direct the flow of the saliva into the mouth while the external fistulous track is closed by stimulating granulation in the external opening by the use of silver nitrate or pure carbolic acid, care being taken not to allow the caustics to extend beyond the external orifice. If this procedure fails to heal the outer opening, the edges of the orifice should be pared and closed with fine catgut sutures.

Another method that has proven effectual is to lasso the distal end of the duct with a silk strand armed with two slender straight needles made to enter the external opening and engaging the end of the duct drawing the end inward through a punctured incision made on the inner side of the lip with a bistoury. The edges of the fistula are then freshened and brought together with fine catgut. The wound is dressed with a small pad of bichloride or sterile gauze held in place by strips of zinc oxide plaster.

The operative work is not of so serious a nature but what it can be done under cocaine anæsthesia unless the patient is of an extremely nervous disposition; if so, a general anæsthetic should be administered.

DISLOCATION OF LARYNGEAL CARTILAGES

The laryngeal cartilages, as is well known, surround the larynx situated at the upper end of the trachea. Their arrangement about the important organ of voice, and their location in the neck so exposed to external violence not infrequently causes displacement. The most common causes of the morbid state are kicks, blows, and force displayed with the thumb and fingers in the act of choking. The author once saw a severe case of this injury, in consultation, caused by the passage of a wagon wheel over the neck. In this case several of the cartilages were displaced, resulting in death from asphyxia. The symptoms attending dislocation of the laryngeal cartilages are swelling, pain, dislocation, and marked dyspnea.

Treatment. The nature of the treatment will depend upon the degree of displacement of the cartilages. If this be slight it may be possible to replace the cartilages by manipulation, but immediate tracheotomy will be required to relieve a severe injury of this nature where the patient gets his breath under distressed conditions. Following this operation repeated efforts should be made to adjust the displaced cartilages and then to give attention to other wounds received.

SUPPURATION IN FRONTAL SINUS

Suppuration taking place in the frontal sinus is the result of active inflammation which generally extends upward from the nasal passages through the infundibulum.

Individuals suffering from chronic ozena or catarrhal affections of the nose are prone to attacks of the morbid condition. Exposure to sharp cold atmosphere usually brings on an acute attack which is accompanied by severe supra-orbital pain, often of a throbbing nature, eyes sensitive to light, headache, rigors, fever, thirst and tenderness on pressure over the affected area. The attack may involve both sinuses and soon result in necrosis and abscess formations, the purulent fluid sometimes burrowing through the thin shell-like bony structures surrounding the sinus, finding exit in the cranial cavity and

sometimes into the orbital space; in the former case meningitis is often provoked by the presence of the purulent fluid and cerebral abscess is not uncommon; in the latter case a bulging of the eyeballs (exophthalmos) indicates the forcible entrance of pus into the orbit.

Treatment. The treatment of this morbid condition will be by surgical measures which will consist of opening up the sinus, by making a slightly curved incision along the upper margin of the orbit through the soft structures down to the bone, the upper margin of the wound should then be well retracted, exposing the skull over the sinus which is next opened with a bone cutting drill or chisel and mallet. After draining off the purulent fluid the external wound is closed by approximating the margins and securing them with fine catgut sutures, always leaving a little space for drainage which may require the insertion of a small drainage tube in some cases. Burrowing of pus may require the enlarging of the primary opening in the skull even extending the original opening in the frontal bone downward along the side of the nose, chiseling a furrow in the nasal bones.

Every effort should be made to prevent the scar tissue from dipping down into the sinus opening while the wound is healing.

ELONGATION OF UVULA

The uvula, being composed of muscular and areolar tissue, is subject to dropsical and hypertrophied enlargement, following inflammatory action of the adjacent structures. The congestion that is generally present and due to this cause excites a harassing, tickling sensation in the throat, attended with cough and a constant hawking to clear the throat of mucus. At length the uvula becomes elongated, dropping down through the relaxation of the parts, so that its tip rests upon the base of the tongue, setting up a constant tickling sensation when talking.

Paralysis of the levator palati and azygous muscles will cause the uvula to drop or become elongated as in the other condition mentioned. In marked cases, the persistent efforts to clear the throat provoke nausea and vomiting. The patient's

sleep is broken at night by a snoring respiration and unpleasant dreams.

Treatment: The milder cases can be relieved by the topical application of astringent medicinal agents when due to simple relaxation of the organ and soft palate. Touching the relaxed tissues with a sulphate of copper pencil, followed by the use of a one per cent. solution of the drug sprayed in the throat three or four times a day, will soon bring about a cure in most cases. When the morbid condition is due to paralysis, warty or vascular growths, the redundant portion should be excised, which is done by grasping the tip of the uvula with a pair of long forceps, making slight traction downward and forward, cutting off the dependent portion with scissors just above the grasp of the forceps. Seldom is there any hemorrhage following the operation and the post-operative inflammation gives little trouble. The patient should use a gargle for a few days, composed of the following agents:

R.
    Spc. Tr. Echinacea ...,............................—....3 iij.
    Witch Hazel ....5 ss.
    Aqua Dest., q. s. ....—..............fl. O j.
  M. Sig.—Use as a gargle every two or three hours.

When excising the uvula, care should be exercised not to remove too much of the organ, lest troublesome hemorrhage ensue and the efforts of speech be interfered with.

PART FIFTEEN

Lesions of the Eye and Ear

TUMOR OF THE EYE

The tissues about the orbit are frequently the seat of both cysts and solid growths, the latter being either benign or malignant. Cysts are frequently of the dermoid variety, which are usually found about the upper brim of the orbit. Their development is somewhat slow, is attended with but little inflammatory action, and they are painless.

The hydatid cyst usually springs from mucous tissue, develops more rapidly than the dermoid variety, often attaining considerable size and is very vascular. Cystic growths are more commonly met with than are the solid tumors.

Fibrous growths spring from the muscular structures about the orbit, develop slowly and are usually quite painful. They usually attain the size of a large marble and are very dense.

Malignant tumors are generally of the epitheliomatous or sarcomatous variety. This form of growth may spring from any portion of the orbit, developing symptoms in keeping with the gravity of the case. Tenderness, pain and local swelling, are the predominating symptoms accompanying their development. Sarcomata often attain the size of an egg and may contain more or less thin serous fluid.

Osseous tumors of the orbit (exostoses) are generally of small size and of ivory hardness. The most prominent symptom noted during the development of the growth is pain, which is largely due to pressure of the soft parts.

Treatment: The treatment of cystic growths about the eye will be by incision and cauterization, or complete excision under aseptic precautions. The epitheliomatous growth may be attacked first with chloride of zinc mixture, which is composed of equal parts of chloride of zinc and glycerine, under cocaine an-

æsthesia. The caustic agent is painted over the abraded surface of the growth once a week until the necrotic tissue becomes thoroughly impregnated with the fluid; the wound is then dressed with a mixture of salicylic acid and borax in glycerine in the proportion of twenty grains of the acid, and a drachm of borax to the ounce of glycerine. The necrotic tissue macerated with the zinc caustic will soon become detached under the influence of the salicylic acid and borax mixture, the wound soon filling in with new granulations. In many cases of epithelioma, the salicylic mixture will be sufficiently potent to completely modify the destructive effect of the ulcer and favor the healing process.

Sarcomata and carcinomata should be removed by excision early in their development, and if the growth extends or involves the eyeball or its immediate structures, the entire contents of the socket should be cleaned out under general anæsthesia. The wound should then be dressed with the salicylic mixture mentioned above or some other potent antiseptic.

Exostoses should be removed by cutting through the base with bone cutting forceps or small bone chisel, unless the base be very broad, when situated so that it may be approached. The eye may have to be sacrificed in order to reach and remove the tumor.

Following operations on the eye, the utmost care should be exercised to prevent infection. The wound should be dressed with Thiersch's solution or a twenty per cent solution of phenol-sodique and kept closed with sterile gauze and bandaged.

ENUCLEATION OF THE EYE

Complete removal of the eye-ball is often required by the presence in the eye of foreign bodies, sympathetic irritation, malignant tumors, traumatic injuries, and degenerative disease.

The destruction of an eye from injuries caused by foreign bodies, frequently sets up a sympathetic irritation in the other eye that often threatens the loss of vision. The sympathetic inflammation may soon follow the traumatism or set in weeks or even months after the injury, increasing gradually in severity, until the first affected eye is removed. The presence of tumors

and degenerative disease in an eye is just as liable to excite sympathetic inflammation in the other eye as is traumatism.

The transmission of disease takes place through the agency of the ciliary and optic nerves and becomes apparent through irritation, pain and tenderness on pressure, conditions augmented by attempts to use the eye.

The early symptoms indicating an approaching sympathetic ophthalmitis are suffusion of the eye, photophobia, lack of power of accommodation, and more or less distress in attempts to use the eye; morbid changes of the interior contents of the eye soon become manifest. Iritis usually supervenes which is soon followed by plastic exudates. The humors of the eye become cloudy or opaque, which dims the vision to a marked degree.
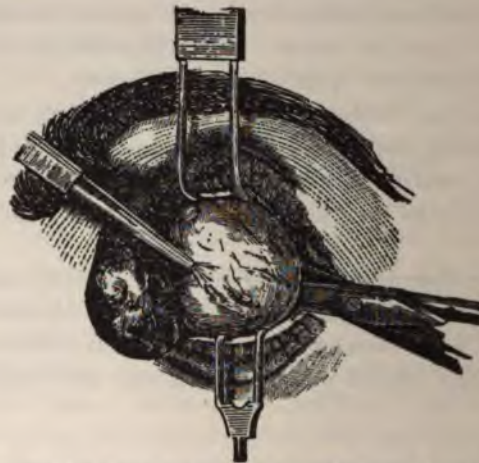
Fig. 105.—Enucleation of the eyeball. (*Howe.*)

The degree of the loss of vision depends upon the course that the exciting cause runs; in some cases the loss of vision takes place very quickly, but more often it comes on gradually.

From the foregoing it seems plainly indicated, when the injured or "exciting" eye should be removed, for, unless the loss of vision in the sympathizing eye is threatened, enucleation should not be executed.

Before removing the eye, the lids and surrounding parts should be rendered aseptic with a solution of boric acid. The

operative work may be done under cocaine anæsthesia, if the patient is not exceptionally nervous, otherwise chloroform had better be administered. The lids should be separated and held apart with a spring speculum. The external coat of the ball is grasped with a mouse-toothed fixation forcep and held firmly with the left hand, while with the right, the ocular conjunctiva is severed entirely around the margin of the cornea, with a pair of scissors curved on the flat; this done, the tendons of the several ocular muscles are fished up with a blunt hook and divided with scissors near their insertion. The eye can then be pulled slightly forward, while the conjunctiva is reflected back and with the curved scissors, the optic nerve is severed, together with any adjacent tissue that may be attached to the ball. Usually there is not much hemorrhage following the removal of the eyeball, but should it be profuse, the orbit may be temporarily packed with bits of sterile gauze, dampened with adrenalin chloride and held in place with a bandage if necessary, but the bleeding usually stops in a few minutes. The wounded area is next cleansed with boric solution, when the margins of the conjunctiva are approximated and one or more sutures of fine catgut placed to secure them. The wound is now bathed with a weak solution of bichloride, (1-5000), or boric solution and dressed lightly with pledgets of absorbent cotton and bandaged; care should be taken that free drainage is established and that re-dressings are done often enough to keep the wound in a healthy state. If all goes well, the wound should heal in two weeks, and an artificial eye may be worn in two or three months a part of the day, but should be removed at night and placed in a solution of weak salt water or boric acid solution.

TENOTOMY FOR STRABISMUS

A deviation of the visual axis, caused by a shortening of certain muscles of the eyeball, produces an abnormal condition of the eye, known as strabismus or squint. A convergent squint, or cross-eyes, is a condition where the visual axes meet before reaching the object looked at. In divergent squint the visual axes meet beyond the object. Mild forms of squint in young

children, where the visual axes do not intersect, may be greatly benefited, if not cured of the defect, by treating the eyes with a solution of atropia, two grains to the ounce, for a period of two or three weeks, when, if no benefit is noted, the mydriatic should be discontinued. If benefit follows its use, it should be continued for several weeks, but only once or twice a day at the last.

The proper fitting of glasses to strabismic eyes will aid, if not entirely cure, the visual defect; thus, eyes having a convergent squint should wear glasses having a divergent focus; those having a divergent squint should be fitted with glasses having a convergent focus. If hyperopia or myopia coexists with the above visual defect, these conditions should be given first consideration.

Tenotomy is advised in all cases where the visual defect cannot be relieved by the use of atropia or glasses. Mild cases should be deferred until after puberty. Extreme cases can be corrected at any time after five years of age.

The tendon to be divided is on the side to which the eye deviates, the operation being executed as follows: After cleansing the eye with boric solution, a few drops of a four per cent solution of cocaine should be instilled in the afflicted eye; the conjunctiva over the contracted tendon is picked up with mouse-toothed forceps and snipped away with curved scissors. The shortened tendon is then fished up with a strabismic hook and carefully pulled into the open wound in the conjunctiva, where it is partially or completely severed as the individual case may require. Very little hemorrhage is met with and comparatively none if a few drops of adrenalin chloride is added to the cocaine solution. The after-dressing will consist of instilling in the eye every two or three hours, a few drops of boric solution and keeping it closed and at rest for a few days.

If both eyes are affected and only one is to be operated on, the one is chosen that has the greatest defect. It is the rule to operate on but one eye at a time.

The instruments needed will be a knife, curved scissors, eye speculum, strabismus hooks, toothed forceps, needles and needle-holder and a little absorbent cotton, gauze, and two-inch gauze bandage.

STAPHYLOMA OF THE EYEBALL

Staphyloma means a protrusion of some part of the sclera or cornea of the eyeball. The morbid state is due to a thinning of the coats of the eye by ulceration or perforation, which varies in extent, causing partial or complete bulging of that portion of the coat remaining intact. The protruding portion may assume a globular form, but it is more apt to be lobulated in scleral staphyloma and conical in the corneal variety.

Fig. 106.—Staphyloma.
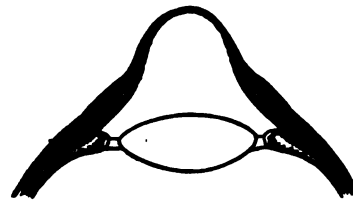
Fig 107.—Staphyloma, with a marked thinning of the cornea.

The bulging mass varies in size from a slight elevation of the attenuated coat to a protrusion so large that the lids can with difficulty be closed over it. A staphyloma occurring at the posterior portion of the eyeball cannot be observed except through the aid of the ophthalmoscope, when it appears as an irregular spot, usually on the upper or inner side of the optic disc. An individual afflicted with a posterior staphyloma usually suffers from inflammation of the coats of the eye adjacent to the bulging portion, together with a wrong of vision, generally myopia.

As the primary cause of staphyloma is generally inflammation, the tension of the eyeball is, in most cases, increased, but not always.

The symptoms accompanying staphyloma of the cornea are increased tension, tenderness and pain due to degenerative changes in the structures of the eyeball; the surface of the protruding mass is dry when of large size and often shows a tendency to ulceration if the case is one of long standing. Not infrequently, the bulging mass ruptures, allowing the aqueous

humor to escape, when, if the rent heals, a line of scar-tissue
is plainly observable. Very often the eye remains in a collapsed
condition.

Treatment: The treatment of staphyloma of the cornea
will depend upon the degree of the protrusion. In mild forms
of the affection an iridectomy should be executed to reduce ten-
sion, followed by bandaging when feasible, placing over the eye-
ball a compress of absorbent cotton. The length of time the
bandage should be worn will depend upon the result following
the iridectomy. The more pronounced forms of staphyloma

Fig. 108.—Excision of a staphyloma. (*Howe.*)

should either be excised or the eyeball should be enucleated. If
this course be decided upon, the patient should be placed under
a general anæsthetic and the eyeball and surrounding tissues
thoroughly cleansed with some potent antiseptic solution, the
bichloride (1 to 10,000) being preferred; although a dilute solu-
tion of the alkaline mixture will prove efficient. After introduc-
ing the wire speculum the conjunctiva is divided around the mar-
gin of the cornea down to the sclera with sharp curved scissors,
the margins of the wound should then be dissected back as far
as the insertion of the recti muscles, the tendons of which are
hooked up with a squint hook and severed with scissors; those
on the inner side of the eyeball should be severed last. The
sclera is grasped with toothed forceps on the outer side and
sufficient traction made to permit of the optic nerve being

reached and severed with strong curved scissors. After the globe has been removed the parts should be cleaned with a solution of bichloride (1-6000), the margins of the conjunctiva should be approximated and united with fine catgut.

Hemorrhage is controlled by packing and inflammation by antiseptic washes. For further operative technic in connection with enucleation of the eyeball the reader is referred to that operation noted in another part of this work.

Staphyloma of the sclera will require that an iridectomy be done, or an evisceration, and in the worst form of the affection enucleation should be advised, all of which work should be done under strict antiseptic precautions.

STYE—HORDEOLUM

Stye is the name given to a small furuncular tumor appearing on the margin of the eyelid, and due to obstruction of a meibomian gland, caused by inflammation of the connective tissues embracing the tarsal cartilages. Irritation of the lids and eye-strain are given as common causes of the affection.

The morbid development does not attract attention before it attains the size of a grain of wheat, but the patient in the meantime complains of a burning and stinging of the lid, with more or-less stiffness experienced in opening and closing it. The inflammatory action may extend from the lid to the conjunctiva, rendering the eye red and suffused.

The morbid growth usually reaches maturity in ten days to two weeks finally terminating in suppuration, following which the inflammatory state rapidly subsides. Occasionally the formation of the stye extends over a period of several weeks, if not months, the little tumor remaining hard and tender during this time; If it does subside to some extent after a time, it will again appear upon the slightest provocation, and often in an aggravated form.

The local symptoms usually observed during the formation of a hordeolum are redness, swelling, tenderness, and a burning pain in the margin of the affected eye-lid.

Treatment: The treatment of stye will be, in the main, by

local applications of hot antiseptic solutions, especially in the early phases of the affection. Small compresses should be wet in the alkaline solution previously mentioned in this work, or a two per cent boric acid solution, and placed in contact with the affected lid. If the developing pustule cannot be aborted by this form of treatment, it will soon show a point of pus, when it should be punctured with the point of a sharp bistoury and the small amount of suppurating fluid turned out. A recurrence of these growths indicates a lowering of the systemic vitality, which requires constitutional treatment by way of tonics and alteratives. Sulphur, iron, Donovan's solution of arsenic, and the calcium salts, in appropriate doses, will usually find a place in the treatment of pustular affections of the eyelids or other portions of the body when due to scrofula or other constitutional disorders.

Cases with scaly and indurated tarsal margins will be greatly benefited by applying to the affected part at bedtime an unguent composed of the following ingredients:

R.
    Cocaine ....gr. v.
    Iodine crystals ....gr. iij.
    Tar ointment ....℥ ss.
M. Sig.—Apply locally.

SURGICAL AFFECTIONS OF THE EAR

Through congenital malformation, traumatism, and morbid growths, the external meatus may be partially or completely closed. The abnormal state resulting from these various causes, will be accompanied by a certain degree of deafness, which is usually in proportion to the occlusion of the external auditory canal. When the morbid state is due to congenital malformation, outside of the defect in hearing, symptoms may be absent, but when due to other causes, there is usually present more or less tenderness around the ear, pain, and a ringing in the ear (tinnitus) besides a certain degree of deafness.

The cause of the defect will suggest the form of operation required in each individual case. Cystic and blood tumors should be opened under strict antiseptic precautions, cauterized

if necessary, with pure phenic acid and dressed with campho-phenique, Thiersch's or other antiseptic solutions and pledgets of lint or cotton. If the latter can be utilized to produce pressure it will aid materially in preventing a recurrence of the cyst.

When the defect is due to the presence of a polypus, it should be removed by torsion, excision, or with a wire snare, using campho-phenique or phenol-sodique as an after dressing.

Operation for relief from congenital atresia has not been as successful as the surgeon might hope for, even when a buried auditory canal existed. Many cases are on record where the atresia was entirely due to osseous obstruction, making surgical procedures entirely unjustifiable. In other cases, where the canal was opened up, the disposition of the artificial opening was to close as soon as the gauze packing was removed. Cases of cutaneous occlusion can be successfully operated on and hearing restored in most cases, if other conditions are normal.

Congenital deformity of the auricles should be treated by plastic operation, under strict antiseptic precautions. Portions of the cutaneous and cartilaginous tissue may be removed by elliptical incision, so shaping the auricle that it will conform to normal conditions.

The solutions for after dressing should be in alkaline character. Thiersch's and phenol-sodique in varied strengths, being given the preference. The wound should be well protected with sterile gauze and cotton dressings. To prevent scarring, an effort should be made to produce healing by first intention instead of by granulation.

Inflammatory states of the external ear is a common affection and is apt to follow traumatism, irritation from extreme heat and cold, and skin affections such as eczema, erysipelas, and herpes. Not infrequently the inflammatory action reaches such a degree that suppuration follows. In such cases, pain radiating over the side of the head and face is a prevailing symptom which is markedly increased by pressure, yawning and mastication. This symptom is apt to increase in severity, until the abscess bursts or is opened by the surgeon. Tenderness and swelling of the surrounding parts is nearly always present, which is often attended with itching and soreness of the auricle. As the inflammatory action subsides, there may be more or less discharge

from the ear of a semi-purulent nature. Tinnitus is often a troublesome feature of the affection, as is deafness, which, if present, is generally due to obstruction of the external auditory canal from swelling of the surrounding parts. There is usually a temperature of one or two degrees above normal, attended with thirst, restlessness and loss of appetite.

The treatment has for its object the subduing of fever and allaying of local pain. The first may be accomplished by the administration of spc. tr. gelsemium, combined with aconite or veratrum, according to the presenting indications calling for these remedies. In cases of abscess or mild forms of suppuration, echinacea should be given in alternation with the above remedies.

As a local treatment in the early stages of the disease, cooling lotions are advised. Twenty grains of menthol crystals cut with two drachms of alcohol and added to eight to ten ounces of slippery elm water or carbolized water, serves a good purpose; pledgets of absorbent cotton should be wet with the solution and applied to the inflamed parts and renewed every hour or two. In extremely painful states, five grains of cocaine can be added to a half ounce of carbolized glycerine and water or boric acid solution and applied to the external meatus on plugs of cotton or lint. If blebs or small abscesses form, they should be opened and dressed with some potent antiseptic solution.

Hot applications, either dry or moist, seldom bring relief, but often increase the pain, menthol in ichthyol, applied around the ear usually produce good results.

Foreign bodies placed in the external auditory canal and left for a short period of time generally produce more or less irritation, resulting often in serious nervous disturbances. Children are prone to put grains of corn, peas, beans and other hard substances in the canal while at play, which will soon set up a train of symptoms quite distressing, especially where a grain of corn or a bean forms the obstruction; in the course of a few days, these obstructions will absorb moisture and swell, painfully distending the canal and making removal extremely difficult.

The symptoms that usually follow the impaction of foreign

bodies in the external auditory canal are local tenderness, dull throbbing pain and restlessness.

Before the surgeon sees many of these cases the auditory canal and surrounding tissue have been made extremely tender from efforts made by the parents or others to remove the obstruction with crude instruments, severely bruising and excoriating the surrounding soft parts; in such cases, the patient should be placed under chloroform, the external meatus lubricated with olive or cocoanut oil, the obstruction seized with toothed forceps and carefully removed, enmasse if possible, otherwise it should be crushed or separated with sharp beaked forceps and removed in pieces. Great care should be exercised in executing this work not to further injure the deeper portions of the ear by pressure or with the instruments. After the removal of the obstruction, the auditory canal should be carefully syringed out with warm boric solution or a ten per cent solution of phenol-sodique, three or four times a day and the canal kept lightly plugged with pledgets of lint moistened in the antiseptic solution. Not infrequently more injury is done the ear in efforts to remove foreign bodies than would be produced by the object if allowed to remain.

Insects are usually quite promptly removed by instilling a few drops of olive oil or melted lard into the external auditory canal, followed, if necessary, by syringing with warm water.

Should the external auditory canal become infested with the larvæ of insects, as it does sometimes, they may be easily eradicated by instilling two or three drops of ether or chloroform and oil in the canal, following in a few minutes with some mild antiseptic wash, used with a small ear syringe. A 1-1000 bichloride solution instilled in the ear will generally destroy the larvæ of insects within a few minutes.

A plug of accumulated cerumen may completely fill the external auditory canal. In such cases, the patient complains of tinnitus aurium and vertigo. The hearing will also be greatly impaired.

To remove the cerumen, the plug should be softened with warm glycerine and water, soapsuds, or equal parts of water and peroxide of hydrogen, when well loosened, the mass may be removed with a pair of dressing forceps.

Growths occurring in the external ear should be removed by excision, under strict antiseptic precautions. This method will prove curative in most cases of benign tumors, but is somewhat doubtful in malignant growths. The general health of the patient should receive attention, if the vital forces are found to be flagging, the patient should be given peptics and tonics and good nourishing food.

Rupture of the drum-head frequently occurs as a result of blows received upon the external ear. The immediate symptoms following the injury are pain, tinnitus aurium, and impaired hearing.

The treatment consists in keeping the meatus occluded with a pledget of cotton or lint, avoiding, if possible, the use of watery fluids in the canal. If the pain is severe, the cotton plug may be wet in a solution of cocaine and boric acid, before placing it in the meatus of the canal. The hearing in most cases is restored.

OTITIS MEDIA

Otitis media is an acute inflammation of the mucous membrane of the cavities of the internal ear. It may be due to cold, but is oftener caused by infection from a purulent catarrhal condition of the naso-pharynx.

The symptoms accompanying attacks of the inflammatory disease are fever, acute pain in the ear, deafness, and a rapid, full pulse. A macroscopical examination of the external auditory canal generally reveals a marked redness of the drum-membrane, which presents a bulging appearance sooner or later, caused by pent-up purulent fluid. Perforation of the drum usually occurs within a few days, allowing the pus to escape; if this has not taken place the membrane should be punctured with a sharp pointed bistoury, otherwise the septic fluid may be forced into the adjacent structures. The mastoid antrum becoming infected, the parts about the ear show a reddened and swollen condition, and are very painful on pressure and not infrequently become œdematous; this condition is almost sure to follow involvement of the mastoid cells. If extension of the disease is not staid by operative measures, the lateral sinus

may become involved and the meninges of the brain also setting up a septic inflammation of these structures, terminating in pyæmia, brain abscess formations and death. The patient often presents a haggard appearance from the great suffering from pain, loss of appetite, rest and sleep, and often goes into rapid decline.

Treatment: The treatment will vary to meet the prevailing indications. If, in the acute form of the disease, the drum-membrane is found bulging, it should be punctured at once, evacuating the septic matter; following this operation, the external auditory canal is to be irrigated frequently with quite warm boric acid solution. It is thought best by some operators to incise the membrane early, as by so doing the acute pain is generally relieved and the wound heals in a few days.

As soon as there is evidence that the disease has extended to the cells of the mastoid process, it should be opened up by making an incision behind the ear, commencing about three-quarters of an inch above the level of the meatus and extending it backward and slightly downward, dividing the soft structure to the bone. The periosteum is dissected up, and it, with the margins of the wound, are held well apart with retractors. The osseous structure over the antrum is opened with a small sharp chisel or gouge. The mastoid antrum usually lies from a quarter to three-fifths of an inch below the external surface. The cavity should be carefully cleaned of purulency with sterile gauze and properly packed with the same.

If it is found that the disease has extended farther along the cellular tissue, the necrotic portion should all be removed before packing. The external wound is then partly closed, leaving room for the drainage strips.

METHODS OF INFLATING THE TYMPANUM

Inflammatory disease of the internal ear often results in occlusion of the tympanum through a puffiness of the mucous membrane lining that cavity, to the extent that deafness in a marked degree follows. To relieve this morbid condition, it be-

comes necessary to inflate the tympanum, which is done by various methods.

Before attempting inflation, the nose and pharynx should be thoroughly cleared of mucus with warm alkaline solution diluted to meet existing conditions, using a spray instrument or cotton swab.

Politzer's Method is accomplished by forcing air into one nostril through a nose-piece attached to a short piece of rubber tubing, fastened to a rubber air bulb of good size, while the nostril on the opposite side is closed with the finger; the patient making an attempt to swallow at the same instant that the Politzer bag is compressed by the surgeon. This should be done several times at each sitting.

Valsalva's Method is quite easy of execution and is accomplished by the patient forcibly closing the nose and mouth and at the same time attempting to force the breath through the nose by blowing; several attempts may have to be made before the effort will be crowned with success.

The patient should be cautioned against making a too strenuous effort to force air into the nasal chamber at first, as often severe pain in the ear is likely to follow, besides dizziness and headache.

MASTOID ABSCESS

Acute inflammation of the mastoid process, resulting in suppuration, is rare as a primary affection, the morbid state usually arising from an extension of middle-ear inflammation. In the early phases of the disease the inflammation may be entirely limited to the periosteum of the mastoid process, the morbid state passing on to the lining membrane of the mastoid cells through the continuity of structures in other than simple cases. Owing to the delicate structure of the cells they soon break down under necrotic conditions, abscess formations developing and burrowing through the cortex, or the posterior wall of the meatus, or the pus may find its way into the cranial cavity through the lateral sinus. If the posterior fossa be invaded by the purulent fluid, meningitis usually follows, terminating later in pyæmia or brain abscess.

If the purulent fluid forms beneath the mastoid periosteum it may soon find its way to the surface, and where it collects within the cells or antrum and later breaks through the external canal the chances for recovery without resorting to operative measures are very favorable. Not infrequently the cell spaces become obliterated by inflammatory debris and the osseous tissue becomes dense and hard, rendering operative measures upon these structures exceedingly difficult.

As has been stated before, mastoiditis is more frequently the result of suppurative diseases of the middle-ear than from all other causes combined; however, the morbid state is frequently encountered as the result of exposure to extreme cold and traumatic injuries. In ulceration and abscess formations in the post-nares and throat, micro-organisms, staphylococci, and streptococci, are likely to find their way to, and set up destructive inflammation of the middle-ear. In cases where pus has accumulated in the middle-ear it is difficult to determine its exact location, or to estimate complications arising from sinus disease.

The symptoms present in primary acute mastoiditis are local heat, accompanied with pain, which may be slight at the outset, but increasing in violence as the disease progresses. If the morbid state is confined mostly to the periosteum of the mastoid process there will be redness, swelling, and tenderness over the affected area, and the patient will run a temperature during the first few days of the attack of two or three degrees. The tongue will become coated as the disease advances, and thirst and restlessness will be marked features in many cases. While pain is a marked characteristic feature, it is not confined to the affected area in all cases; the symptom may extend to the entire side of the head, but it is usually most severe in the occipital region. If the inflammation terminates in suppuration there is likely to be a profuse discharge from the ear within four or five days following the primary attack. Marked diagnostic symptoms of the accumulation of pus in the cellular structure are œdema of the soft parts overlying the mastoid, rigors, hectic fever and pronounced physical prostration. In cases where suppuration is suspected without discharge from the ear, the drum-head may be found to be bulging from pressure of

the abscess fluid from within the middle-ear. Should such a condition present, the drum-head must be incised at once to afford the necessary drainage.

If the suppurative fluid burrow anteriorly it may find its way to the muscular structures of the neck, forming an abscess, or point in the pharyngeal region. In such cases, there will be spasm of muscles on the affected side, causing the head to be held or fixed in one position, and all attempts to move or turn the head will provoke spasm and pain. A prominent diagnostic symptom of retropharyngeal abscess is the inability to move the lower jaw without causing great pain. In some cases the protrusion of the tongue causes acute distress.

Treatment: The most effective treatment in the acute attack of mastoid disease is the application of moist or dry heat to the affected region, in the form of hot salt bags or water in an aural rubber bag at a temperature of 105° to 120° F. for four or five days, or until the acute inflammatory symptoms have in a measure subsided. Much benefit will be derived during this stage of the disease by painting over the mastoid region a solution of aconite or veratrum, a drachm of the tincture to the ounce of water applied three or four times a day. The following prescription will give excellent results in feverish and restless conditions:

R.
Specific aconite ....gtt. x.
Specific gelsemium ....3 ss.
Aqua dest., q. s. ....fl. 3 iv.
M. Sig.—A teaspoonful every hour or two as may be needed
to meet existing conditions.

The specific echinacea can be added to the above prescription with great benefit, if local and general symptoms indicate suppuration.

If the application of heat to the mastoid region seems to aggravate the local symptoms, as it will in some cases, it should be discontinued, and cold should be tried, in the form of the ice-bags, or cloths wrung out of ice water, the effect being watched that local conditions are not made worse by the change. Should these remedial measures fail to stay the progress of the disease within a week or ten days, operative measures will most likely have to be resorted to.

The prominent indications for operation are the membranous swelling at the inner end of the auditory canal, persistent tenderness over the mastoid process, a swelling or puffiness over the affected area, evidences of necrosis of the bones of the middle ear, which will appear as fistulæ or granulations in the external auditory canal, an offensive discharge from the ear, and the formation of fistulæ behind the auricle.

Whatever remedial measures are adopted, they should not be persisted in too long, at the expense of the patient's strength, lest the operative procedures later resorted to will have a fatal termination. The morbid condition is dangerous; operative procedures are not, if executed by a skillful operator. Opening up the mastoid at an early period gives vent to pent-up fluids and affords an opportunity to remove necrotic tissue, giving the only chance to avoid a fatal result.

If for any reason the patient should not be placed under a general anæsthetic, it is possible to do the operation under local anæsthesia, unless the patient be a child or a supersensitive adult. A two to four per cent solution of cocaine is the strength usually selected for the work. The tissues should be infiltrated as the work progresses: the flow of blood and suppurative fluids prevents excessive absorption of the anæsthetic agent during the operation.

Wilde's incision through the overlying soft parts is the first step in the operation. Its outline is circular and extends from the base of the mastoid to its apex and about one-half inch behind the auricle and parallel with it down to the bone. No important blood vessels are encountered, hence, very little hemorrhage is met with. The periosteum being laid open, each edge should be pushed aside, and the bone penetrated at a point just below the level of the upper border of the external meatus, and well to its posterior border, and in the direction of the long axis of the external auditory canal, a distance of a half inch or more, using a bone drill or a small crown trephine a quarter of an inch in diameter. If pus is present, it will make its appearance as soon as the outer shell of the mastoid is penetrated by the drill. The opening should now be enlarged with a small sharp gouge and any necrotic tissue removed with a sharp curette, the wound flushed out with some potent antiseptic

fluid and packed with sterile iodoform gauze, supplemented with dry antiseptic dressings and bandaged. The dressings should be removed at least three times a day following the operative work, that the progress of the disease may be noted. The wound should be dressed antiseptically from day to day until pus ceases to form, when the traumatism is allowed to heal.

During the operative work, the surgeon must take care that he does not make the incision in the soft parts too high, lest he sever the posterior auricular artery; and in opening up the mastoid the long axis should be carefully followed and the bone drill, or trephine guarded with care, to prevent entering the lateral sinus, the external ear, or the cranial cavity. Meningitis frequently follows as the result of entering the cranial cavity with probe or bone drill. A timid operator is very apt to stop with too small an opening, in his efforts to drain the field of suppuration; ample drainage is the only safeguard in these abscess cases.

The patient's general condition must be noted during the period of convalescence; physical weakness and digestive disturbances will call for peptics, tonics, and stimulants, and the most nourishing of viands. Constipated states of the bowels should be relieved with laxative doses of cascara, and the skin kept stimulated with brisk salt rubs and baths.

DISEASE OF THE LACRIMAL APPARATUS

The lacrimal apparatus consists of the lacrimal gland and sac, the lacrimal duct, canaliculi and puncta. The structures composing the apparatus are subject to destructive inflammation and the duct subject to occlusion from inflammatory deposits and obstruction, caused by the presence of foreign bodies. Obliteration of any portion of the glandular outlet may also result from wounds in or near the duct.

The usual symptoms observed in connection with obliteration of the lacrimal duct are tenderness and pain, swelling and redness of the part with an overflow of tears, and not infrequently an abscess forms in some portion of the canal. In case

the inner edge of the lid becomes everted through traumatism, it forms a just cause for the overflow of tears.

Treatment: The treatment of occlusion of the lacrimal duct will depend upon the nature of the obstruction; when due ⋅ to a swelling of the lid in connection with acute conjunctivitis, the inflammatory state must be removed to restore the canal to its normal condition. The eye should be bathed with boric acid solution, using an eye-cup for the purpose, every two or three hours, following with a few drops of a solution of the following mixture:

℞.
  Lloyd's Hydrastis .... ℥ j
  Solution Adrenalin Chloride .... gtt. xx
  Distilled Water, q. s. ....fl. ℥ j
M. Sig.—Instill a few drops in the eyes every hour or two, using a medicine dropper.

During the height of the inflammatory action, the eyes should be kept bandaged or dark glasses should be worn.

If foreign bodies are found in the canaliculi, they should be removed with pointed forceps, if possible. The mouth of the duct may have to be slit with a sharp pointed bistoury to reach the object that causes the obstruction, before it can be grasped and removed. In cases where the tear duct is merely contracted as a result of inflammatory action, the canal should be dilated with a conical sound, or the contracted portion may be split, using a small bladed knife to execute the work.

Cases of chronic inflammation of the lacrimal sac (mucocele) are due to obstruction of the lacrimal duct, caused by a puffiness of the mucous membrane, ulceration and stricture.

The treatment should embrace the use of soothing and astringent washes, such as boric acid, salt, witch-hazel, hydrastis, bichloride (1-6000), and copper, used with a small syringe having a small, straight or curved tip. The canal is often cleaned out with a weak solution of argyrol (gr. xx to ℥ j) with good results after dilating it with a small conical probe. The yellow oxide of mercury applied to the inner edge of the lower lid in small quantities, also proves of benefit in muco-purulent discharges from the canal. The patient should be instructed to make pressure on and gently massage the soft parts

over the sac two or three times a day, to express the accumulated secretion and aid in keeping the canal open.

Abscess formations in the duct are to be treated by enlarging the canal with graduated sounds or lacrimal knife, evacuating the purulent fluid, subsequently cleansing with antiseptic washes.

In cases of obliteration of the canal, due to traumatism, total extirpation of the lacrimal sac may become necessary, if the duct cannot be opened up with sounds or the lacrimal knife.

OPERATIONS FOR CATARACT

The opacity of the crystalline lens or capsule may be partial or complete, and to relieve the morbid state and restore the sight two operations are resorted to, discission and extraction; the former is generally executed in soft or partial opacities which usually appear in early life.

The instruments required to do this work consist of a wire speculum, a pair of toothed forceps, and a Bowman's or Knapp cataract needle; besides the instruments there should be at hand several gauze or cotton sponges, a bowl containing a solution of boric acid or bichloride (1-6000), and gauze material for bandages.

Previous to the operation the eye should be thoroughly cleansed with some potent antiseptic solution. Children and nervous individuals should be given a general anæsthetic; others can withstand the little pain under the influence of local anæsthesia; a four per cent cocaine solution to which a few drops of adrenalin solution are added, is an efficient mixture for this purpose. An hour before the time set for the operation a mydriatic should be instilled in the eye to produce dilatation of the pupil.

When all is in readiness the speculum should be introduced and the eyeball held firmly with fixation forceps, while the cataract needle is thrust through the cornea a little forward of the limbus and on through the pupillary opening and capsule of the lens, making short cuts in the latter at right angles. This will suffice for the first or preliminary step. In the course of a

month or six weeks the operation should be repeated, the needle being pushed farther into the substance of the lens and made to rotate a little from side to side, cutting through the lens substance. At the end of four or five weeks, the third and last needling should be done, provided no inflammatory action exists to jeopardize the work, otherwise a longer wait should be taken. At this sitting the posterior portion of the capsule should be lacerated, care being taken not to injure other structures of the eye.

Following the last operation, the eye should be kept shaded from the light for a few days and the pupil kept dilated with atrophine.

There will likely be an escape of lens substance through the pupil into the anterior chamber of the eye, which will be absorbed in the course of time if no other complications arise, such as iritis and glaucoma; the latter often requiring a later operation for removal of the lens.

To execute the operation for the extraction of the lense, together with its capsule, other instruments will be required besides some of those mentioned in connection with discission of that organ. A narrow-bladed cataract knife, spatula, a wire lens scoop and spoon, and two cystotomes, a straight and slightly bent one, are those likely to be needed in the work.

The head should be somewhat elevated and the speculum introduced. To steady the eyeball it should be grasped below and to one side of the cornea with the fixation forceps and held firmly with the operator's left hand, while with the right he transfixes the cornea by entering the knife in the corneal

Fig. 109.—Wolf's method of incising the cornea for extraction of the lens.

margin a little above the horizontal meridian, pushing it through
and making it emerge on the opposite side at a point opposite
that of entrance, and by an upward sawing motion the section is
completed, keeping entirely within the scope of the corneal
tissue, but terminating in the line between the cornea and
sclera. When executing this part of the work the operator
may stand behind or in front of the patient. At the conclusion
of the incision the cystotome, slightly bent at the end, is intro-
duced through it into the anterior chamber from the temporal
side, although it may be inserted from the outer side if for any
reason the other position be not feasible. The point of the
instrument is then turned and brought in contact with the
capsule of the lens and made to cut it in opposite directions,
using care not to use force enough to displace the lens. This
part of the work accomplished, the lens is dislodged and ex-
pelled through the corneal incision by pressing alternately on

Fig. 110.—Forcing the escape of the lens through the in-
cision in the upper segment of the cornea. by alternating
pressure upon the upper and lower portions of the eyeball.

the lower portion of the cornea with the spoon and the upper
portion of the globe with the end of the index finger. After
the lens has left the pupillary opening, its removal is often
facilitated with the aid of the wire loop previously mentioned;
besides, any part of the iris that might be disengaged or be-
come involved in the incision can be quite easily replaced with
the delicate instrument.

Following the expulsion of the lens, the lids should be moved over the anterior surface of the eyeball to aid in the expulsion of blood clots from the anterior chamber; also to cause fragments of the soft structures surrounding the lens to emerge from the incision where they may be snipped off with scissors if necessary. The iris, if displaced in the procedure, should be worked back into position either by working the lids over the cornea or by utilizing the spatula and wire loop to this end. Following the operation, the eye should be cleansed with warm boric acid, or what is better, normal saline solution (about xv gr. to water ℥ iv), and the margins of the wound are then adjusted and the lids closed and a bandage comfortably applied over both eyes.

Subsequent dressings consist in merely sponging the external lid with warm sterile saline solution, not making any attempt to raise the lids to cleanse the eyeball of discharges for ten days, although mucopurulent fluid when appearing along the margins of the lids may be removed with a warm solution of boric acid, using a medicine dropper for the purpose.

For the first day or two the patient should be urged to remain very quiet in bed, upon the back the entire time, if possible, to relieve in a great measure, ocular pressure; after this period of time, if no complications arise, he may lie on the well side.

It will be well to instill a drop of atrophine solution in the eye once or twice a day, after the acute effects of the operation have passed, which will usually be in three or four days, and about this time the bandage may be removed from the well eye and the patient permitted to sit up a part of the day. If all goes well, the dressing may be removed from the operated eye, after which dark glasses should be worn.

TRACHOMA

Trachoma or granular conjunctivitis is a specific infectious inflammatory disease of the mucous membrane of the eyelids, pied by symptoms of burning and soreness of the lids, mucopurulent discharge, and a granular

appearance of the mucous coats of the lid. The granulations at first are pulpy or translucent in appearance, which later gives way to a fibrous state of the tissues. These sago-like granulations become manifest after the subsidence of the acute inflammatory stage and extend well into the tissues of the lids. The granulations are larger and firmer than are those pulpy elevations often in catarrhal conjunctivitis, also spoken of as granular lids, from which they should be distinguished.

In the severe cases of trachoma there is danger of contraction of the lids and opacity of the cornea from the formation upon some portion of its surface of a false membrane. The disease is actively contagious and is usually transferred from one person to another through the careless use of handkerchiefs and wiping towels.

Owing to the great irritation provoked by the granular conjunctivitis the cornea soon becomes decidedly vascular and later more or less hazy. The margins of the lids soon become thickened by the developing granulations, markedly interfering with opening and closing them. Persons suffering from this morbid disease of the eyes are incapacitated from nearly all kinds of labor, as they cannot endure light, drafts of air, or other offending objects that provoke irritation.

The severest cases are generally seen in families living in poverty, having unsanitary surroundings, with poor food, scant and dirty clothing, with a general lack of personal cleanliness.

Treatment: When the causes of trachoma are as above mentioned, the first step to be taken in the line of treatment will be the improvement of the patient's general condition; strict cleanliness along all lines will be of the first importance. Not only should the patient be frequently bathed in weak borax water, but the clothing should be kept clean and free from contaminating matter of every kind. As these patients are usually poorly fed, a most nourishing diet should be prescribed. Towels and handkerchiefs should be changed often and restricted to the use of the person afflicted.

The general physical condition of the patient should next receive attention. The function of the kidneys and bowels should be kept normal in action, and digestive disturbances corrected if such a condition exists. Feverish states and strumous

conditions of the system will call for Spc. Tr. of aconite, or vera-
trum combined with echinacea, phytolacca or berberis aqui-
folium. Constipation will require an occasional dose of the
salines, or phosphate of soda, and the kidneys excited to action
by sweet spts. of niter; Spec. Tr. of apis, citrate of potash in
small doses.

A variable appetite is whipped up with peptics and tonics
and anemic states are to be medicated with iron, arsenic, the
phosphates and the several preparations of lime and soda.

The local treatment will vary to suit the individual case
applying for relief. Cases suffering from acute inflammation
will do well at the outset when bathed every two or three hours
with the following solution:

> ℞.
> Adrenalin Chloride ....gtt. x.
> Cocaine ....-............ ....gr. iij.
> Witch Hazel ....-..℥ iij.
> Aqua dest., q. s. ....-.....fl. ℥ j.
> M. Sig.—Apply to the everted lids with a camel's-hair pencil.

The effect of the lotion reduces the vascular tension of
blood vessels and renders the eyes less sensitive to light. If only
one eye is affected, care should be exercised to avoid, if possible,
the infection of the other eye. At all times the affected eye
should be kept free from the purulent discharges by frequent
instillation of antiseptic washes, of which the alkaline wash
modified in strength to suit the case in hand, and a 1-10,000
bichloride solution will serve a good purpose.

The active granulating surfaces will need touching once
every day or two, for varied periods of time, with caustic and
astringent agents. The sulphate of copper pencil and solutions
of varied strengths made from the same caustic agent are in
extensive use for this purpose, and a cure eventually follows
the judicious use of the potent remedy.

Varied strengths of nitrate of silver are frequently em-
ployed to destroy the granulations, but its application causes
severe pain unless the tender and inflamed surfaces are previ-
ously painted over with a four per cent. solution of cocaine. The
first applications should be made from a five per cent. solution,
followed immediately by the alkaline-solution; later a one-half

to one per cent solution will suffice. The remedy is not as popular as the copper solutions. Sulphate of zinc is used by some, and glycerol of tannin also serves a good purpose. Great care should be taken not to use the active caustics so strong as to cause undue contraction of the tissues of the eyelids.

If there remains a marked vascular opacity of the cornea (pannus), following the relief of the chronic conjunctivitis, an infusion of jequirity should be painted over the everted lids several times a day for a week or more; if the expected relief does not follow, the vascular supply to the cornea should be cut off by incising portions of the ocular conjunctiva at the margin of the cornea embracing the active blood vessels, or the vessels may be punctured with the point of a sharp tenotome under cocaine anæsthesia. Under the same method of anæsthesia, the false membrane (pannus) resting on the cornea may be removed by carefully scraping it off with a sharp blunt-pointed scalpel or spud.

Whatever method of treatment is adopted in the severe type of trachoma, it may, in some cases, have to be persisted in for months to effect a cure. During the progress of the treatment the patient should remain in a darkened room during the day, or wear dark glass shields to protect the eyes from the light.

PTOSIS

Ptosis is a falling of the upper lid of the eye and may exist in different degrees of disfigurement. A moderate drooping of the lid is quite common, but inability to raise it is seldom observed, except when it is due to paralysis of the levator muscle. It may result from some congenital defect, also inflammatory swellings and traumatism.

Persons having this defect in rather a marked degree call into use the muscles of the forehead to aid in raising the lid to such an extent that the skin usually maintains more or less of a wrinkled condition. Vision will in the course of time be affected to a greater or less degree by the occlusion of light in extreme cases of ptosis.

Treatment: The treatment, at the outset, should consist in removing the cause when this is possible. When due to weakness of the nerve distributed to the muscles of the eyelid, massage, galvanism and strychnia used locally with the hypodermic needle will prove of benefit and often results in a cure. In other cases only temporary relief is obtained.

Various methods of operation have been advised for the cure of the defect, all resulting in some benefit. A longitudinal strip of integument of the lid can, with ease, be removed and the margins of the wound brought together and united with fine catgut, narrowing the lid sufficiently to overcome the obscuring of vision. Instead of dissecting out a strip from the surface of the upper lid a longitudinal fold of skin extending nearly the length of the lid may be picked up with T-forceps and held securely while the necessary number of catgut sutures are inserted (using the quilted form) to maintain the fold in this position, using care not to puncture the under side of the lid with the needle while placing them. The upper portion of the lid is the site usually chosen from which to form the fold, making it less observable when completed. For temporary benefit, the lid may be narrowed by the application of collodion longitudinally across the lid. The contraction of the superficial tissues will raise the margin of the lid well toward the level of the pupil. Strips of adhesive plaster applied lengthwise of the lid are often resorted to for the same purpose, but are more noticeable than is the liquid collodion and not so lasting. In applying the latter, care should be used not to get any of the liquid in the eye, as it is extremely irritating.

The more extensive operation of dissecting up the skin and uniting the tendon of the levator muscle to that of the temporal is sometimes resorted to in congenital cases, but the percentage of cures has not been such as to make the procedure a popular one.

IRIDECTOMY

To execute an iridectomy is to remove, by excision, a small portion of the iris. The operation is done to relieve the tension within the eyeball in staphyloma and glaucoma; for removal of

foreign bodies and small growths appearing in the iris; chronic iritis; in prolapse of the iris; to enlarge the pupillary opening to improve the sight and to aid in the operation for cataract.

Instruments usually required to do an iridectomy are a Graefe cataract or a narrow straight-bladed knife, fixation forceps, eye speculum, curved iris forceps, small curved scissors, blunt iris hook, and a small, partially curved spatula and one or two probes.

Unless the patient is extremely nervous the operative work can be done under local anæsthesia except, perhaps, in cases when the eye is much inflamed or tumors or foreign bodies are to be removed; here a general anæsthetic should be given. Adrenalin chloride instilled upon the eyeball will reduce the blood supply and tension within the tissues, and aids in the anæsthesia when used with the cocaine solution.

With the coats of the eye rendered aseptic, the operator places the wire speculum so as to widely separate the lids, and, fixing the globe by grasping the conjunctiva below the cornea with fixation forceps, the cataract knife is made to enter the sclera above the cornea a line or two back of the limbus, the boundary line between the cornea and sclera, and thrust downward and forward in the middle line until it appears in the anterior chamber; on withdrawing the knife the wound should be made of sufficient size through which a section of the iris may be seized with iris forceps and pulled out of the incision and snipped off with the curved iris scissors. In making the incision in the sclera, care should be taken not to wound the iris, cornea, or the capsule of the lens, to prevent if possible, intraocular hemorrhage.

The size of the section of the iris removed will depend entirely upon the purpose for which the operation is done. If for relief from glaucoma, fully one-fifth of the circle should be removed, extending from the pupillary margin to the circumference of the iris, including the ciliary attachments. A smaller section of the iris is removed as a rule, when an iridectomy is executed as a preliminary step to a cataract operation. The successive steps of the operation are the same as for glaucoma.

An iridectomy for the enlargement of the pupil, or to establish an artificial pupil, is done through a small horizontal in-

cision in the cornea made about two lines external to the limbus; the pupillary margin of the iris is grasped with a delicate pair of iris forceps and pulled out of the corneal incision where it is cut away with scissors.

The extent of the necessary loss of iris in case of a tumor or traumatism of that colored membrane will depend altogether upon the character of the individual case.

If there is a tendency for prolapse of the margins of the iris following the operation, they should be replaced by gentle compression with the iris spatula. Hemorrhage into the anterior chamber frequently takes place during the performance of iridectomy; the presence of the blood seldom does any harm, as it is generally absorbed within ten days to two weeks. Small clots may be removed through the corneal incision immediately following the cataract operation.

The eye should be cleansed after the operation with boric solution, and bandaged. The patient should be kept at rest in bed for a week or ten days. Complications must be met as they arise.

Surgical Dressings and Instruments

RUBBER MATERIAL IN SURGERY

Rubber tissue, or dam, is used for various purposes in surgical work. It can be purchased in thin sheets in large and small sizes at surgical instrument depots, in rolls, or preserved .in antiseptic fluid. Its chief uses are those of a protective in the repair of necrosis of the bones, in the treatment of wounds, especially those of amputation, where it is applied over the gauze dressing and as a protective in skin grafting. Strands of gauze drainage for abdominal and deep flesh wounds are frequently wrapped in rubber dam to prevent the flesh from adhering to the meshes of the gauze.

Previous to its application to wounds, it should be sterilized by boiling in a one per cent soda solution and then immersed in a solution of carbolic acid 1-20, or bichloride solution 1-5000.

Rubber drainage tubes are to be had in various sizes and lengths from the shops, where they are to be found in sealed glass tubes containing antiseptic fluid, or, when these are not to be had, suitable ones may be improvised from large catheters and suitably sized rubber tubing, by providing holes for drainage near one end. These should be sterilized before using by boiling in a one per cent solution of bi-carbonate of soda and after washing in sterile water they should be kept in clean glass jars and covered with alcohol. Bichloride solutions should not be used for this purpose, as the chemical action of this potent agent upon rubber material is decidedly injurious.

Rubber gloves that fit the hands snugly should be more generally worn when doing abdominal surgery, by the assistants as well as the operator, as they can, by proper care, be rendered absolutely sterile, while there is always an uncertainty of being able to free the skin of the hands from septic material.

The gloves should be sterilized in a boiling soda solution and kept immersed in alcohol in a glass jar until required for use, when they should be rinsed in warm sterile water or normal saline solution. After using they should be washed in borax solution, rinsed in sterile water and wrapped in a sterile towel to dry.

Rubber catheters should be treated the same as rubber tubing, to keep them sterile, but gum-elastic catheters cannot be boiled or even placed in hot antiseptic solutions without blistering the surface. They are best washed with green soap and water, dried and sponged with lysol, then immersed for a moment in the alkaline solution previously referred to, wiped dry and placed in a case, where they will be free from contaminating influences.

VARIETIES AND USE OF BOUGIES

Bougies are long, slender instruments utilized to dilate the natural outlets of the body for diagnostic purposes. They are made of various kinds of material and in different forms to meet the requirements in any given case; thus there is in common use filiform, bulbous, and olive-pointed urethral bougies made from whalebone, hard rubber, and silk or linen; also the flexible metal staff instrument with graduated olive-shaped points; the esophageal bougie, made of whalebone with graduated olive-shaped points, is utilized to dilate the esophagus in case of stricture of that muscular tube. It is about twenty inches in length and very flexible. There is another instrument made for the same purpose, constructed of silk or linen fabric that is olive-pointed, the shaft of which is cylindrical or slightly conical and the surface very smooth, made so by the external coating of wax.

Rectal bougies are conical at the point and are to be had in graduated sizes; they are usually made of silk or linen and thoroughly gummed and varnished. The shaft is clylindrical or conical and some ten inches in length. They are used for the purpose of dilation and exploration of the rectum.

Bougies for certain purposes are sometimes made from celluloid, their smooth surface and nonabsorbent qualities are

features in their favor, yet their brittleness, when cold, makes their use in deep cavities somewhat hazardous when the instrument is small.

The principal use of the filiform bougie is in stricture of the urethra of extremely small caliber. One of these slender instruments may be **coaxed** through the narrow indurated portion of the urinary canal after which a tunneled sound or Gouley catheter may be passed over it and through the stricture into the bladder.

In the treatment of certain diseases, such as gonorrhœa, proctitis, and other inflammatory affections of the mucous membrane of these canals, medicated bougies, the base of which is cocoa-butter or gelatin in which the medicament is incorporated, are often used with good results. They are made of different lengths, varying from two to four inches and the size of a small pencil for the urethra and much larger for the rectum.

COLLODION AS A SURGICAL DRESSING

A common and efficient surgical dressing is composed of sterile gauze and collodion. It is necessary that the collodion be of excellent quality to insure that it adheres well. It should not be applied to inflamed surfaces, when caused by sepsis, as vesication is apt to follow. The flexible fluid made after the following formula serves the purpose well:

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℞.
    Castor Oil ........................................... ℥ ij
    Canada Balsam ....................................... ℥ iv
    Collodion, q. s. ....................................fl. ℥xij
M.
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Simple punctured wounds, and those made for exploratory purposes, can be sealed at once by wetting a small piece of gauze or lint with the collodion and placed over the puncture.

Wounds following operations in the inguinal and perineal regions, should be first rendered sterile, then covered with a strip of gauze which should be sealed over with collodion. Once this form of dressing becomes dry, infection of the wound by urinary and alvine secretion, or interference by the patient or friends with the wounds, is rendered well nigh impossible;

besides the dressing cannot shift and frequent redressing is avoided.

Deeply incised wounds should first be closed with interruptured sutures and as there is likely to be more or less serum exudate following the traumatism, it will be well to first cover the wound with several layers of gauze to absorb the exuding fluid over which a liberal quantity of the collodion should be applied with a small camel's hair brush, the paste extending about one-half inch on the skin surrounding the gauze dressing. If no symptoms of sepsis follow, a redressing should be done in about a week. Parts covered with hair should be shaved before the dressing is applied, otherwise much pain is experienced in its removal. Ether painted over the surface will liquefy the collodion, which will aid in its removal.

X-RAY IN SURGERY

Of late years much dependence has been placed on what the X-Ray will reveal in obscure cases coming within the province of the surgeon's work, by determining the existence of fractures, dislocations and foreign substances within the body, and applied as a curative agent to lupus, eczematous ulcers, and malignant growths, when located in or near the surface of the skin.

In the hands of an expert the existence of a fracture, and the location of a foreign body, is accurately determined; not so easily if the apparatus is operated by a novice. This fact will be understood when it is explained that to take a skiagraph of the morbid structure, certain conditions must be complied with that experience alone can adjust. Then, one must remember that the skiagraph of the body is not a photograph of that structure; it is merely a shadow of the object that is in some measure impermeable to the light or rays which are prevented from reaching the sensitized plate upon which the shadow is cast. Keeping this condition of things in view, the expert will point out features in the skiagraph that will be of note to the surgeon, that others would overlook.

To arrive at a correct interpretation of the morbid state

from skiagraphs, two or more should be taken from as many vantage points, as one may correct a false impression magnified by the other.

The apparatus necessary to take skiagraphic shadows of morbid and other objects is either a storage battery or a motor and transformer; Crooke's tube; induction coil; current interrupter; a fluoroscope and sheet lead for protection to the adjacent skin surface.

To obtain a perfect skiagraph of a fracture, or other morbid conditions, an exposure to the ray will be required of from a few minutes to a half hour, according to the nature of the object from which it is required to obtain the shadow; the operator bearing in mind, during the exposure, the danger of burning the skin, resulting later in a loss of tissue from death of the part.

It is a common practice with some surgeons, who possess an X-Ray apparatus, or have access to one, to take a skiagraph of every case of fracture that falls into their hands for treatment. The "shadowgraph" not only enables the surgeon to be sure of his diagnosis, but it instills confidence on the part of the patient when shown the nature of his injury.

As stated before, the X-Ray is an aid in diagnosis, but can add nothing to the treatment of fractures. Of late years, an effort has been made to introduce skiagraphic pictures in court as valued mute testimony in fractured injuries in cases which recovered with bad results and ended in suits for malpractice, with only partial success from a legal point of view, as the "shadowgraph" can not do more than show the extent and nature of the existing deformity; it can impart no knowledge regarding the many obstacles the surgeon has had to meet and overcome during treatment by way of muscular action; systemic diseases, complicated injuries, and the noncompliance with the surgeon's instructions on the part of the patient.

The X-Rays are invaluable in locating needles, pins, or minute particles of metal that may find their way into the body tissues. A skiagraph should be taken from views that are at direct variance with each other, to accurately determine the position of the foreign body; in this way coins, small nails and other foreign bodies are located in the e
that other means would fail to discove

To determine whether or not a renal calculus exists in disease of the kidney, with the X-ray, is one of the important uses this diagnostic agent can be utilized for. In this case great care should be taken that a forming calculus that is likely to be transparent (any many of them are,) be not overlooked. Calculi that are markedly opaque are easily outlined.

Vesical calculi may also be readily diagnosed by means of the X-Rays. This course will emphasize discoveries made by instrumental means; besides, the existence of encysted calculi can be thus determined when for various reasons the steel sound will fail to detect their presence. Chief among these reasons may be mentioned a saculated bladder, tumors, and an enlarged prostate gland.

It is advised, when making a skiagraph of vesical calculi, that the sensitized plate be placed beneath the pelvis and the tube over or near the last lumbar vertebra, so that the rays will pass diagonally through the true pelvis, so as to give the outline of the pelvic outlet accurately and distinctly. The diagnosis of aneurysm of the large blood vessels can be very accurately determined by the aid of the X-ray in most cases. The plate is placed behind the back, whether the patient is sitting or lying down, and the tube held in front of the chest, about sixteen inches from the plate. An exposure of from 5 to 15 minutes will be required to produce a good 'shadowgraph" of the arterial tumor.

SPLINTS

In the treatment of fractures and the correction of deformities a great variety of splints have been suggested by surgical practitioners. As regards the variety of material from which splints may be fashioned to meet the wants of the surgeon, it may be said that there is hardly a limit. The materials in common use are heavy pasteboard, cardboard, lath, thin boards, ... leather; and for all ordinary pur-
.... fashioned by an ingenious results will follow as if employed.

Other and more expensive varieties of splints are made from woven-wire, felt, gutta-percha, perforated sheets of zinc, plaster-of Paris, and the plates and rods of iron and steel. In city practice, where surgical depots carry a variety of these, variously fashioned and highly polished, ready-made fracture dressings, the surgeon may find something that will conform to his idea along the line of a fracture splint, but, after all, the success he obtains from its application is no better than the country doctor gets from his improvised wooden splint, often fashioned in a crude manner from the roughest of material.

Before applying the simple wooden splint, a thick layer of cotton or other soft material should be bound to the side that is to rest against the surface of the limb, by running on a roller bandage. This will form a cushion-like surface that prevents injury from pressure.

Before adjusting the felt or leather splint, it should be cut to the shape desired, moistened by placing it for a moment in warm water, when it can be moulded to the injured part. This form of splint should also be padded before bandaging it in place. The plaster-of-Paris or moulded splint is made by re-doubling a plaster bandage of the desired width after first wetting it in warm salt water, to the required length and thickness, pressing each layer as it is laid with the hand to insure its adherence and the elimination of air between the folds. Ten to twelve layers of the plaster-bandage are usually required for a splint heavy enough to dress all ordinary fractures. The splint should be moulded to the limb while it is yet damp, or before the plaster hardens. For fracture of the leg, two or three of these plaster splints may be required to properly hold the parts in position.

A pasteboard splint fashioned as represented in the accompanying cut, moistened and adjusted to the elbow and secured with a roller bandage makes a very efficient dressing for fracture of the condyles of the humerus. Before adjusting it the pocket-like splint should be well padded inside with cotton. It is secured in place by running on a roller bandage.

The long board splint, extending from the arm-pit to a few inches below the foot, is a favored dressing with many surgeons, for fracture of the thigh. It is held in place by a belt fastened
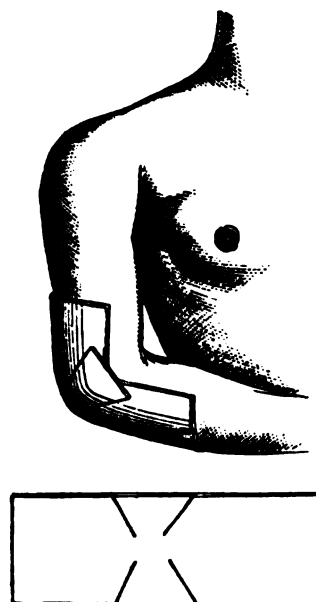
Fig. III.—A pasteboard splint fashioned, dampened, and then moulded to the elbow. A bandage should be run on to hold it securely in place.

to the upper end, which is buckled about the chest, while the foot and leg are fastened to the lower portion of the splint by strips of adhesive plaster. The splint is so arranged that extension can be made in cases requiring this to be done.

Of the several appliances constructed for the treatment of fractures of the leg and thigh, the double-inclined splint or plane supplies a useful device. The splint is of special value in the treatment of fractures occurring near the knee joint, as there is a tendency to displacement of the ends of the bones through the medium of the attachment of the powerful muscles found in this region. With this form of splint adjusted, traction is made by the weight of the pelvis and upper part of the thigh. Through the medium of a foot-piece attached to the lower part of the splint the foot is secured with a turn or two of a roller-bandage or adhesive plaster, and extension provided for by means of the weight and pulley, or the extension rods with which this form of splint is usually supplied.

The angular metal fixation splint, for compound fractures
of the elbow joint, forms a valuable device for the treatment of
this very frequent injury. Its form of construction and method
of application is not unlike the pasteboard splint above referred
to.
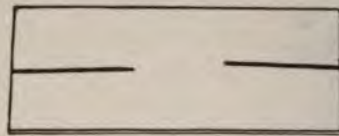
Fig. 112.—A piece of pasteboard
cut in from each end, then cut in
form to fit the chin.

Fig. 113.—The splint dampened
and folded ready to be applied to
the chin.

Another form of pasteboard splint, fashioned from a heavy
piece of the material, and utilized in the treatment of fracture of
the inferior maxillary, is quickly made from a piece of card or
pasteboard four inches wide and about eight inches long. Split

Fig. 114.—The splint adjusted to the chin, and held in
place with a bandage.

each end to within an inch or so of the center as shown in the
cut, Fig. 112. After wetting the splint, fashion it into the re-
quired shape, as is represented by Fig. 113. When it is adjusted
to the lower jaw and held in place by several turns of a roller
bandage, it makes a satisfactory dressing, and is well shown in
Fig. 114.

PART SEVENTEEN

Lesions of the Abdomen and Enclosed Organs

PENETRATING WOUNDS OF THE ABDOMEN

Penetrating wounds of the abdomen are generally due to knife-stabs and gunshot injuries and vary in degree of severity in proportion to the extent of the injury done to the internal viscera.

The symptoms following this form of injury are those of shock, where the traumatism is extensive; in less severe cases, the symptoms are often obscure. The result of wounding the intestines will depend largely whether or not they are empty or filled at the time of injury with ingesta in an advanced state of digestion. Intestinal gas will escape into the peritoneal cavity from a mere puncture of the intestinal wall that will excite active peritonitis in most cases, which is more or less complicated with hemorrhage, if the penetrating instrument severs one or more blood vessels. A knife blade thrust into the abdominal cavity or a high velocity bullet passing through it is very likely to inflict more than one wound in the intestinal track, making the injury extra hazardous to life.

The presenting symptoms in such cases are a frequent wiry pulse, hurried respiration, tenderness and pain in the abdomen, cold clammy skin and a subnormal temperature. Tympanites soon supervenes and the patient frequently vomits bloody ingesta. The passages from the bowels are infrequent and usually contain more or less blood. Unless surgical measures are early adopted, the patient soon goes into a collapse, from which he does not recover.

Treatment: The treatment of abdominal wounds of a penetrating character, consist in opening the ventral cavity for exploratory purposes, after which, all bowel matter and bloody fluids should be cleared away with a hot saline solution, the rents in the bowel sought for and closed in a manner required

by the nature of the case.   Sections of the intestine, together with the annexed mesentery, may have to be removed in cases where the bowel is extensively injured.   Before closing the abdominal incision, provision should be made for drainage by inserting a wick or gauze strand, surrounded by rubber tissue in the lower angle of the incision or through an opening in Douglas's cul-de-sac in the female.   Silk-wormgut should be used to close the abdominal incision, the sutures including the entire structure of the wall, care being taken to pick up the margins of the peritoneum in each loop.

If the patient is suffering severely from shock before operative procedures are commenced, one-thirtieth of a grain of strychnia should be given hypodermically, and if very nervous, a small dose of morphia may also be administered. During the time the patient is on the table, he should be surrounded by hot water bottles to maintain the body heat and after he has been placed in bed, he should be kept warm by the same means.

Food should be withheld for twenty-four hours or longer, but extreme thirst may be allayed by small sips of hot water or weak tea, also by small rectal injections of weak saline solution, or the same can be administered beneath the skin or into a vein with an apparatus fixed for the purpose.   This form of treatment should be kept up from time to time, while shock continues, with an occasional hypodermic dose of nitrate of strychnia. After the second or third day, if the patient shows favorable symptoms, a few teaspoonfuls of thin corn meal gruel, made without milk, may be taken hot; or if thought best nutriment may be given per rectum, until such time as the patient's condition will allow food to be taken by mouth.

What the outcome will be in this grave injury, no surgeon, however experienced, is able to foretell, as much depends upon experience, careful operative procedure, and the power of the patient to resist shock and infection.

CONTUSION OF THE ABDOMINAL WALL

Contusion of the abdominal wall is not infrequently met with as a result of kicks and blows and other forms of external violence.

The degree of injury will depend upon the amount of force displayed; if this be small, a slight separation of the muscles may occur with little hemorrhage, without breaking the skin, while greater force will rend the skin, fascia, and muscular structure, causing more or less hemorrhage, resulting in hematomata. The wounding of the wall of the abdomen by no means measures the extent of the injury inflicted to the internal organs which may be so severe, in pronounced cases, as to produce fatal collapse from rupture and hemorrhage.

The symptoms following minor contusions of the abdominal wall are local pain and muscular soreness, the pain is of a burning character and the soreness is increased by pressure. When the wound is more extensive and complicated by injury to some one of the internal organs, the pain and tenderness following, are more intense, accompanied by peritoneal irritation, muscular rigidity, nausea, shock, and in many cases collapse, death often resulting from internal hemorrhage or peritonitis.

Treatment: The treatment of contusions of the abdominal wall requires, from the first, absolute rest and the topical application of soothing and cooling applications in the minor injuries, to opening the abdomen and closing by catgut or silk sutures rents found in the liver, spleen, bladder or intestines, after turning out blood-clots and excess fluids found in the ventral cavity. If the muscles of the abdomen are to any extent lacerated, they should be united with catgut sutures and the wound dressed antiseptically.

It is generally necessary to make some provision for drainage before closing the abdomen, where internal organs have been ruptured and blood and other fluids spilled into the ventral cavity. In women, drainage may be established down through Douglas's cul-de-sac, otherwise, rubber tubing or a wick or gauze drain should extend through the abdominal incision to a point near the seat of the injury.

The methods of dealing with ruptured internal organs are given under separate heads in other parts of this work, hence the treatment will be omitted here.

TUMORS OF THE ABDOMINAL WALL

The structures composing the abdominal wall are frequently the seat of both benign and malignant growths; the former usually spring from the muscles and fascia of the parietes, while the latter is generally found in and near the umbilicus. The common varieties of growths usually noted in the abdominal wall are angiomata, fibromata, lipomata, dermoid and other forms of cystic growths. Epithelioma and sarcoma are the malignant growths usually encountered, but are not of frequent occurrence, as a reference to hospital reports will verify.

The symptoms accompanying either of these growths will not vary much from those observed in tumors of a like character situated in other parts of the body. Of course, the degree of distress and discomfort accompanying the morbid condition will depend largely upon the size of the growth and its location.

Treatment: The treatment consists in the removal of the growth, which should be done at an early period in its development. Topical applications of epitheliomatous growths in the early phases of the disease may slow its progress and in some cases a cure may be expected. For this purpose, great reliance can be placed on the application of chloride of zinc, which should be followed by dressings with the following mixture:

℞.
Biborate of soda ....℥ ij.
Salicylic Acid ....℥ ss.
Glycerine ....℥ j.
M. Sig.—One application a day will usually suffice.

LAPAROTOMY—ABDOMINAL SECTION

Abdominal section or laparotomy is the opening of the abdominal cavity for the purpose of examination and to relieve morbid conditions that may be found to exist there. The length of the incision and its location will depend upon the object sought for and the character of operation necessitating the section. Not to unnecessarily weaken the abdominal wall, the anatomical structures composing the same should be well understood, that the incision may be made, when possible, along lines least liable to sever important muscles, nerves and blood

vessels. When feasible the incision should be made in the linea alba and when made in other parts of the abdomen the skin and fascia should only be incised and the muscles separated with the handle of the scalpel or with blunt scissors. It has been observed that muscular structures, when divided in this manner, heal more firmly than when incised, thus preventing hernial protrusions, which often follow opening the walls of the abdomen.

Instruments generally required to do an abdominal section consist of scalpels, several hemostats, scissors, groove director, thumb forceps, blunt retractors, tenaculums, needles and needle-holder, silk-wormgut, catgut, together with sterile gauze and cotton for dressings and bandages.

Except in emergency cases, the patient should be prepared for the operative work by having the bowels opened with the saline cathartics aided with enemas of normal salt solution, or the following mixture:

℞.
    Turpentine .... ℥ j.
    Glycerine .... ℥ ij.
    Warm water, q. s. .... fl. qt. j.
  M. Sig.—Use with long rectal tube and repeat in a few hours
    if conditions warrant.

A thorough borax water bath should be taken the evening before the operation and, if the patient be a female, a vaginal douche of borax water or bichloride solution (1-6000) should be given the evening before and the morning of the operation. On retiring, the abdomen should be scrubbed with green soap and water, and rinsed with sterile water, followed by alcohol. A pack, wet with the alkaline solution, green soap, or bichloride solution, should be kept on the abdomen over night and not removed until the patient is placed on the operating table; the abdomen is then washed with green soap, followed with a thorough rinsing with sterile water and then with alcohol. The field of operation is thus rendered fit for the surgeon to proceed. If for any reason the work is delayed for a few minutes, the abdomen should be covered with sterile towels wrung out of hot sterile water. After the surgeon has properly prepared himself for the operative work, he should observe whether or not his assistants are properly clad; if so, he should

station them in positions where they can render such aid as is required of them during the progress of the operation.

Such instruments as are likely to be needed are then removed from the sterilizer to sterile trays, which are placed within easy reach of the operator and covered with sterile towels until needed. Plenty of cotton and gauze sponges should be at hand, and sterile water in basins, in which the surgeon bathes his hands from time to time during the progress of the operation. With the field of operation surrounded with sterile towels, an incision is made, usually in the median line extending down through the soft structures to the peritoneum, but before opening the latter all bleeding points should be picked up and either twisted or ligated. After wiping dry the gaping wound, the peritoneum is opened in a portion picked up by mouse-tooth forceps, care being taken not to incise a knuckle of intestine that may be attached to the serous membrane. If the incision is made merely for exploratory purposes it need not be more than two inches in length, but the removal of growths, evacuating abscesses, and the breaking up of adhesions, will necessitate extending the peritoneal incision to the length of that in the overlying soft structures, whatever that length may be. To enable the surgeon to see into and conveniently execute the necessary operative work within the abdomen, the margins of the abdominal wound should be held apart with retractors or with traction loops formed of heavy silk threads placed with a long curved needle through the entire thickness of each margin. The loops are preferred to the metal retractors, as they prevent, in a great measure, the separation of the several layers of tissue which are divided when making the linear incision.

At the conclusion of the work for which the laparotomy was executed, the abdominal cavity should be cleared of blood clots and other fluids liable to set up irritation or septic infection, all bleeding vessels secured with a silk ligature, and, after observing that there are no pads or sponges left within the abdomen, the external wound is closed first by uniting the margins of the peritoneum with catgut and the overlying muscular structures by the same material, or the skin and muscular

structure may be united with interrupted silk-wormgut sutures with provision made for drainage if the case requires it.

In all cases where the nature of the case requires much handling of the intestines, or when the peritoneal surfaces become soiled with purulent fluids from evacuating abscess formations, it will be a wise precautionary measure to flush the abdominal cavity well with quite warm normal saline solution, as by so doing the septic fluids are not only washed away but the sympathetic system of nerves is given needful stimulation, which will prove a stimulus to a prompt recovery from the shock of the operation.

Before adjusting the abdominal bandage, which is always a necessary part of the after-dressing, the wounded area should be dusted with some reliable antiseptic powder, boric acid being generally employed for the purpose.

Folowing the operation, the patient should be placed in bed and surrounded with hot water bottles, if there is evidence of suffering from shock. Quiet should be observed, not only by the patient, but those whose duty it is to look after his welfare. The after treatment should be such as will meet morbid conditions as they arise.

INJURIES TO THE STOMACH, LIVLR AND INTESTINES

The stomach, when empty, lies in a flaccid state below the diaphragm and partly beneath the liver and above the transverse colon. The muscular organ weighs about five ounces in the adult and is capable of great distention.

The organ is subject to rupture, when distended with food, from force directed against the anterior wall of the abdomen, as from a kick or blow. Such injuries are of a serious character, owing to the morbid inflammatory state set up by the escape of the contents of the stomach into the abdominal cavity.

A force sufficiently violent to cause a rupture of the stomach may also produce shock of a devitalizing character, yet there may be no external evidence of the gravity of the injury to the region involved. The shock is more profound following force applied to the region of the stomach, owing to the impression

made on the solar plexus, which has resulted in death in a number of instances.

The symptoms observed in traumatic injuries of the stomach are pain, rapid feeble pulse, nausea, respirations quickened, shock, cold perspiration, collapse and sometimes death.

Treatment. Measures for relief are mainly surgical. The patient at once should be prepared as for other laparotomies and placed under an anæsthetic, chloroform being preferred to ether on account of it being less apt to provoke nausea and vomiting. An incision three or four inches in length is made in the median line over the stomach down to the peritoneum. After all bleeding points are secured, folds of the peritoneum are picked up with thumb forceps and divided with a scalpel and then enlarged to the extent of the abdominal wound with scissors; traction sutures are then inserted on either side, including the peritoneum and the overlying tissues. These traction sutures placed and the abdominal opening surrounded with hot sterile towels, the margins of the wound are retracted and the anterior wall of the stomach sought for with the thumb and index finger. After locating it, the muscular organ is carefully brought out through the abdominal wound until the ruptured portion is brought into view. If the rupture is in the posterior wall of the stomach, the entire organ will have to be brought out of the external wound in order to reach and secure by sutures the rent in the viscus. The sutures should be iron-dyed silk and placed about one-eighth of an inch apart, using Lembert's or Halstead's method where possible. When a sufficient number of sutures have been placed the margins of the wound are turned in and the serous surfaces drawn together and secured by tying the inserted strands. If partly digested food has escaped into the abdominal cavity, the abdominal incision should be enlarged and the abdomen flushed out thoroughly with warm normal saline solution and, if conditions warrant, provision for drainage can be made through the inguinal regions. While executing the work, hot gauze pads with tapes attached should be packed around the viscus for protection to its serous coat and to absorb any escaping fluids.

At the outset, if the stomach contains a considerable amount of ingesta, it must be emptied out and the stomach washed with

saline solution, even if the rent in the organ has to be enlarged to aid in the work.

After the rent has been repaired, the stomach is returned to the abdomen and the incision in the wall closed in the usual way. The patient is kept in bed for two or three weeks, during which time the nourishment is given per rectum for four or five days, and then fluids in small quantities by way of the stomach until the rent has had time to heal.

Injuries to the Intestines.

Laceration and punctured wounds of the intestines occur more frequently than do such injuries to the stomach, and the results are about the same. As soon as the walls of the intestines are ruptured, there is an escape of digestive fluids into the abdominal cavity, which soon sets up an active peritonitis, and unless the true condition is suspected and early steps taken to flush out the abdomen with hot soda or saline solution and repair the wound fatal results are about sure to follow.

The operative procedure for the repair of a lacerated or punctured intestine does not differ much from that described in injuries to the stomach. In searching for the wound in the intestine the operator should determine, before closing the abdomen, that more than one does not exist, which is apt to be the case in gunshot and stab wounds. To determine this, several feet of the intestines may have to be turned out of the abdomen into very warm sterile towels. Wounds when found should be closed with silk, using the Lembert or purse-string stitch.

The shock attending these injuries is often profound and requires the application of external warmth, stimulants in small doses frequently repeated and rest in the recumbent position. Should symptoms of peritonitis supervene, the bowels should be opened with broken doses of the salines, aided by enemas of sulph. of magnesia solution given quite warm. Feverish states and restlessness, pain, and early symptoms of sepsis will call for aconite, gelsemium, bryonia, dioscorea, and echinacea in small but frequent doses. Lemonade or water to which some of the fruit jellies have been added may be drunk with a relish. Ice cream and fruitades will find a place, as will soups and broths; nausea and vomiting may be controlled with ginger ale

served on cracked ice, clove tea, or frequent sips of peppermint water.

Injuries to the Liver.

The liver, occupying a prominent position as it does in the abdomen, is subject to lacerations, punctures and gunshot wounds. Lacerated wounds are due to kicks, blows, and falls against some hard projecting point.

Wounds of the liver, if extensive, are usually fatal, hemorrhage and shock being the primary cause. Slight lacerations, if determined early and repaired at once following the injury, give more promise of saving the life of the patient, otherwise septic peritonitis is apt to set in as a serious complication.

The symptomatic indications of a rupture of the liver are pale features, nausea and vomiting, prostration and collapse, frequently terminating in death.

Treatment. As the treatment is entirely surgical, the patient should be perpared for a laparotomy as soon as possible after the nature of the injury has been determined. The upper part of the abdomen should be opened either in the median line or along the costal border. The incision should be free, opening up the abdominal cavity sufficiently to permit of quickly locating the rent in the liver and to empty the abdominal cavity of the bile-stained clots. The location of the clots of blood will often aid in the exposure of the rupture, and the removal of them not infrequently starts afresh the hemorrhagic flow.

Like similar injuries to other organs of the abdomen, the indicated treatment demands prompt action for the arrest of hemorrhage, and next, the immediate repair of the wound, cleansing the ventral cavity of hemorrhagic clots, and promptly adopting means to support the vital powers during the impending crisis.

After disclosing the rent in the liver, it should be packed at once with sterile gauze if hemorrhage is active, and later removing the packing carefully and suturing the gaping wound with heavy silk strands rather deeply placed, using round curved needles to execute the work. Curved needles in handles are exceedingly useful in placing the silk sutures in positions difficult to approach with the ordinary needle in a needle-holder. After

the sutures are all placed they should be tied, using care not to draw them too tightly on account of the friability of the organ, otherwise they will cut their way out.

After the wound in the liver has been closed, the abdominal cavity should be flushed with saline solution at a temperature a little above that of the body. Silk-wormgut sutures can be placed to close the abdominal wound, but not all tied, leaving space to remove long pads of iodoform or sterile gauze, that have been placed next to the closed wound in the liver to serve as packing for a day or two following the operation, in cases likely to keep up passive hemorrhage. The packing removed, the remaining strands are tied.

Gunshot and stab wounds are often of such a character as to demand the plugging of the wound with tampons of sterile gauze to control hemorrhage; in such cases the tampons should remain a day or two and, when removed, should be replaced, if required, by another but usually of smaller size. This is usually done through an incision over the region of the primary wound. In the event that the gall-bladder is ruptured or cut the chances for recovery of the patient are decidedly lessened. The spilling out of bile into the abdominal cavity very soon sets up an active peritonitis, generally terminating in death. In a case of this nature, following a stab wound of the gall-bladder that the author had the care of, the patient showed symptoms of peritonitis the second day. The abdomen was at once opened up and disclosed a general peritonitic state with the surface of all the abdominal organs as yellow as saffron, stained with the escaping bile. The abdominal cavity was flushed with quite warm soda and normal saline solutions, small doses of stimulants were frequently administered to support the waning vital powers, but had little effect; the destructive work of the irritating bile fluid had done its work, and death ensued the fourth day following the fatal stabbing.

Abscess of the liver not infrequently follows traumatic injuries of the organ. If the morbid state is determined early and surgical methods are adopted at once, before the collection of purulent fluid is discharged into the ventral cavity, the chances of recovery are more favorable, otherwise fatal peritonitis very

soon supervenes and the patient often succumbs within a week or ten days.

The symptoms of the developing abscess in the liver are rigors, hectic fever, thirst, restlessness, tenderness and pain in the liver and marked digestive trouble indicated by nausea and vomiting.

Internal medication, other than such remedies that support the strength and vitality of the patient, is of little avail. Quinia, strychnia, and arsenic in small doses, taken in alternation, will find a place in most cases. Poultices applied externally to hurry the abscess formation to a "pointing," have been made use of with varying degrees of success.

As soon as the location of the purulent fluid has been determined, which is done by inserting a long medium sized exploring needle through the walls of the abdomen and into the liver while the patient is under anæsthesia, a longitudinal incision of a sufficient length to give plenty of space to facilitate the work, is made over the abscess and is carried down to the peritoneum, which is picked up and opened between dressing forceps unless the peritoneum is adhered to the overlying tissues; in this case, an exploring needle of a considerable size is introduced through the adhered peritoneum and into the abscess; upon the appearance of pus, the exploring needle is withdrawn and the punctured wound enlarged with a bistoury or scissors; the finger is then introduced and the cavity explored for other abscess formations which, if found, are opened up with the end of the finger, allowing the purulent fluid to escape into the first abscess opened up. The abscess cavities are then cleansed with sterile gauze sponges, exercising care not to further injure the friable tissue surrounding the abscess cavity.

While executing the operative work, the borders of the liver are to be kept in contact with the margins of the external wound, to prevent the escaping pus from entering the abdominal cavity. To aid in preventing this accident, thin sterile pads should be packed around the abscess cavity and within the borders of the external wound; these pads should have tapes attached to them, to prevent their escape into the abdominal cavity unnoticed. After the exposed tissues have been thoroughly cleansed, especially the peritoneum, and hemorrhage

arrested, the packing should be removed from the abscess cavity, if it has been packed; the borders of the liver wound are next placed in apposition with those of the external wound and retained by a continuous catgut suture, leaving space at the site of the abscess cavity for the removal of the gauze drainage previously placed. The external wound and adjacent surfaces are cleansed of the debris of the operation and the wound dressed with several layers of sterile gauze.

In those cases involving that portion of the liver situated beneath the chest wall, a portion of a rib may have to be resected to reach the collection of purulent fluid, or a portion of the opposing costal borders are cut away sufficiently to permit of incising the abscess and establishing drainage.

Following the operative work in such cases, the patient should be instructed to lie upon the injured side much of the time to aid in free drainage.

There is one precaution necessary to keep in mind when operating through the pleural sac; the borders on either side should be joined together with fine catgut, unless the pleura is adhered, to prevent pus from finding it way into the pleural cavity, setting up serious attacks of pleurisy.

The character and profuseness of the discharge will determine the length of time that the drainage medium should be left in place.

Evacuation of a liver abscess by aspiration accomplishes but little along the line of cure; the operation does succeed in relieving pain and such other morbid conditions as follow pressure caused by accumulating fluids. Then, during the quiescent period, the patient is in better condition to respond to remedial agents and dietetic measures to prepare for a more extensive operation.

The long exploring needle should first be utilized to locate the pent-up fluid, then the trocar and canula are carefully introduced through the overlying tissues and into the abscess cavity; the trocar is then withdrawn, leaving the canula, which will serve as a drain to the abscess cavity. If the purulent fluid be viscid and thick, the trocar and canula may not reveal its true nature and location, unless the contents of the end of the

canula be carefully examined under the microscope after it has been withdrawn.

These exploratory operations can be done without much pain to the patient by first narcotizing the tissues through which the needle or trocar and canula are to pass, by infiltrating the tissues with a four per cent solution of cocaine hypodermically administered.

After the removal of the canula the punctured wound in the abdominal wall is sealed with collodion and a small piece of sterile gauze, or by placing a sterile pad over the wound and securing it by several turns of a three inch gauze bandage.

ASCITES—DROPSY

Ascites is an accumulation of serous fluid within the peritoneal cavity and is due to a morbid state of some one or more of the principal organs of the body, as obstruction of the portal circulation, cirrhosis of the liver, tumors, and abnormal states of the heart, lungs and kidneys.

Dropsy or general anasarca is understood to be a general infiltration of the cellular tissue and seems to be not only due to some of the above causes, but a morbid state of the absorbents as well.

The rapid onset of the abnormal state will depend upon the nature of the organic trouble producing it, in some cases the cause is obscure. The extent of the effusion will be determined by inspection, palpation, and percussion; pronounced cases present a full, rounded abdomen, a protruding umbilicus, and expanded hernial sacks, should a hernia exist. The heart's action will be irregular and respiration labored. The appetite is apt to be capricious, the bowels constipated, and the urine scanty; not infrequently the lower extremities are œdematous, also the genitalia.

In cases of obstruction of the portal circulation, the superficial veins show prominently, and dullness on percussion is noted over the accumulated fluid.

Ascites is to be differentiated from cystic tumors, pregnancy, enlarged liver or spleen, and chronic peritonitis and tympanites. Ascites attendant upon attacks of Bright's disease, indicates a speedy dissolution.

Treatment: The treatment of ascites and dropsy is both medical and surgical, and will vary with the cause producing it. If due to valvular insufficiency and weak heart action Spc. Tr. of cratægus, added to an infusion of digitalis, given in small teaspoonful doses every three hours will improve the condition of the heart, besides it has a decided diuretic action upon the kidneys. If constipated, the bowels should be kept moving with jalap and senna, or small doses of elaterium, one-fourth grain, taken in thin gruel every two or three hours, till the desired results are obtained. This will produce copious watery evacuations, and should be repeated every third or fourth day; epsom salts is also recommended in general dropsy. Much benefit is derived from small doses of Spc. Tr. jaborandi or pilocarpine, but the action of this potent agent upon the heart must be noted during its administration.

Spc. Tr. Apocynum is given with good results, combined with an infusion of asclepias, in œdema of the extremities in non-febrile cases.

Active diuretics must be given with caution in dropsy, due to chronic nephritis. Morbid states of the liver and spleen frequently provoke ascites and as malaria, injury, syphilis, gallstones, and alcoholism are the exciting causes the treatment will vary to meet the presenting indications. Tonics, such as quinia, iron, arsenic and the phosphates, can be taken later in the affection.

The diet should be mostly rich and nourishing foods, taken with little fluid, except in renal dropsy, when skimmed milk can be taken freely, and at regular intervals.

The accumulation of fluid within the abdomen may be so great that it will be necessary to tap the peritoneal cavity with trocar and canula, and draw off the fluid to relieve the distention and pressure symptoms.

The method of operative procedure is to empty the bladder, clean the surface of the abdomen with soap and water and follow with some potent antiseptic fluid. To prevent injuring the lateral blood vessels, the puncture should be made in the median line, about three inches below the umbilicus or midway between the umbilicus and the anterior superior spine of the ilium; a trocar is not always used to draw off the ascitic fluid,

Fig. 114a.—Operation for paracentesis abdominis with a trocar.

many operators preferring a large aspirator, claiming for it a greater freedom from sepsis. Before tapping, a binder should be adjusted to the upper part of the abdomen and as the fluid is drawn off an assistant makes gradual compression of the abdominal walls, which prevents, in a measure, syncope, hemorrhage and collapse.

The trocar or aspirating needle is introduced through a small incision made with a bistoury after producing local anæsthesia. The fluid mostly evacuated and the canula withdrawn, the punctured area is sealed in with a piece of sterile gauze and collodion.

The thickness of the abdominal wall should be estimated and the finger adjusted to one side of the trocar before plunging it through into the abdominal cavity.

Hemorrhage is seldom a complication in paracentesis abdominis, should it occur, a gum catheter, somewhat larger than the puncture made with the trocar, should be forced into the punctured wound and left till hemorrhage stops, if this method fails, the bleeding vessel should be cut down upon and ligated.

Drawing off the ascitic fluid by tapping in cases of malignant disease of some one of the principal organs of the body, as in cancer of the liver or spleen, can give but temporary relief and may be done any number of times.
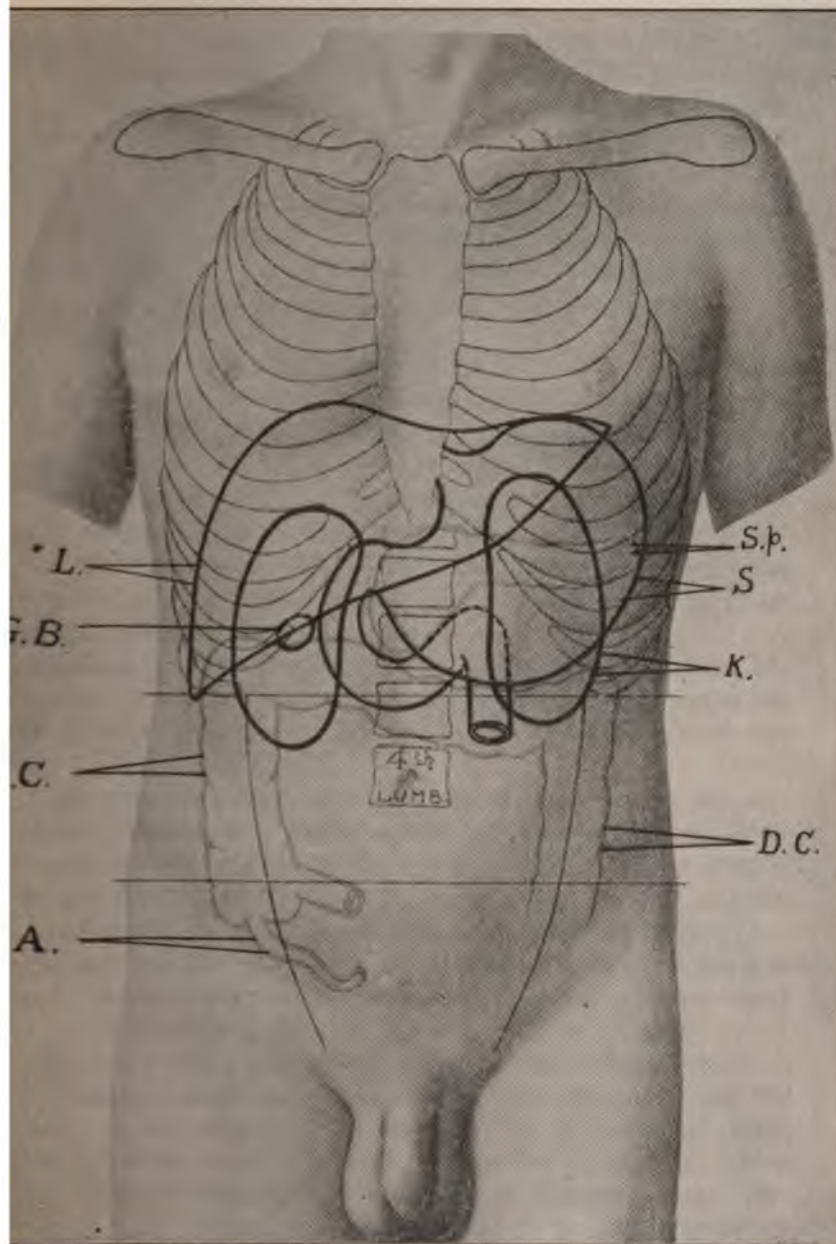
Fig. 114b.—Relative position of the abdominal organs in outline. *L*, Liver; *G.B.*, Gall Bladder; *A.C.*, Ascending Colon; *A.*, Appendix; *S.P.*, Spleen; *S.*, Stomch; *K.*, Kidney; *D.S.*, Descending Colon. (Modified copy after McGrath.)

In a case of tumor of the liver in a woman, twenty-four years of age, the author tapped her twenty times during the period of two years, drawing off a gallon or more at each operation.

A trocar has been plunged into a gravid uterus, mistaking the enlarged organ for an accumulation of abdominal fluid, there is hardly any excuse for this mistake in diagnosis, except perhaps, in a case where ascites exists with pregnancy.

APPENDICITIS

As the name signifies, appendicitis is an inflammatory condition of the vermiform appendix, and may result from numerous causes, chief among which is the presence in the lumen of the appendix of particles of fecal matter or other foreign bodies which excite congestion and tumefaction of the mucous lining of the caudal appendage. Other causes may be cited upon which the morbid condition may depend; such as colds, intestinal disturbances and traumatism.

Whatever the provoking cause may be that excites the hyperemic state, the internal pressure, resulting from structural constriction, often results in ulceration, perforation, and not infrequently gangrene.

The different stages of the disease may present as follows: catarrhal, ulcerative, perforative, and gangrenous; and may follow one another rapidly in the order named. In this morbid state, one or more of the infecting micro-organisms will be present, especially the bacillus coli-communis and staphylococci.

While persons of all ages are subject to attacks of the disease, statistics show that far the greater number of cases occur in those under thirty years of age.

An early and most prominent symptom of appendicitis is pain, which is slight or severe in character, depending on the severity of the attack. This alone is not a sufficient diagnostic symptom, as it is present in intestinal colic, from which it is differentiated by the localizing of the pain about Mc-Burney's point, while that of colic is apt to be more general in character. The pain is distinguished from diseases of the right ovary and tube, as in morbid states of these organs the pain is much below the diagnostic line, extending from the umbili-

cus to the anterior superior spine of the ilium, upon which McBurney's point is established about two inches inward from the iliac point. Then again the pain accompanying appendicitis extends or radiates upwards, while that of tubo-ovarian disease shoots downward toward the pubic region. If tympanites is present in appendicitis, it is general in character, while it is confined to the colon in pelvic inflammations. Pain resulting from appendicitis usually comes on suddenly, while the reverse is the case in pelvic inflammations; however, the surgeon must not lose sight of the fact that appendicitis may co-exist with pelvic inflammatory states.

One of the marked indications of appendicitis is the extreme tenderness, rigidity and spasm of muscles in the right inguinal region, over the inflamed appendix, which usually lasts during the acute stage of the disease.

Nausea and vomiting are usually present in appendicitis, and is apt to mark the extension of the inflammation of the peritoneum; not much reliance can be placed on the pulse and temperature as a diagnostic feature in this disease. As a rule there is an elevation of two or three degrees of temperature and a relative increase in the pulse rate; however, in grave cases, complication with ulceration and gangrene, the pulse and temperature may remain at about the normal standard.

Appendicitis may be questioned in pelvic troubles, where nausea and vomiting, attended with fever, precede the local pain. Rigors followed by hectic flushes are noted symptoms indicating abscess formation, following perforation of the appendix. Constipation is usually an early symptom, however, there may be frequent fluid discharges containing principally mucus during the acute stage of the attack.

At any time during the progress of the disease, violent and alarming symptoms may spring up suddenly, indicating an extension of the disease to the peritoneum, especially is this likely to be the case in perforation of the appendix, setting up a general septic peritonitis.

Treatment: The indications for treatment are the relief of inflammation, tenderness and pain. The former demands the application of wet heat in the form of fomentations of hops

and stramonium leaves, compresses wrung out of a hot solution of witch-hazel and water, or the application of a hot water bag. In cases where heat is inclined to increase the pain, cold applications may give prompt relief; this can be applied through the medium of the ice-coil or cloths wrung out of ice water. The patient must be enjoined to take absolute rest, the bowels should be moved with a saline mixture in cases presenting slight diarrhœa, an increased temperature and pulse, and a fairly clean tongue, indicating the catarrhal form of the disease; especially so if the attack has come on gradually; and let it be said in this connection that purgatives are contra-indicated in sudden attacks of the disease, marked by retching and vomiting, high pulse, coated tongue, with extreme tenderness over a well defined swelling in the region of the appendix; and when, perhaps, this entire train of symptoms has come about within twenty-four hours. Where from the nature of the symptoms, time may be allowed for the action of laxative agents, olive oil is commended as a remedy of great value, given in repeated doses of about three drachms, keeping the bowels well open.

In cases simulating a catarrhal attack of the disease, excellent results will follow deep hypodermic injections in the region of the appendix every three or four hours, one drachm of the following mixture:

R.
Spec. Tr. Belladonna .... gtts vi
Adrenalin Chloride Solution .... gtts x
Hydrochloride of Heroin .... gr. i
Aqua Dest. .... fl. ℥ i
M. Sig.—For hypodermic administration.

This mixture is not to be given in other than catarrhal attacks with any hope of curative effects; but in suitable cases it subdues pain, lessens the inflammatory action, and overcomes tenderness and spasm of muscle.

There are few, if any, internal remedies other than have been mentioned that can be relied on to effect a cure. A drachm of turpentine to one ounce of glycerine, added to a pint of warm water, given by enema, will aid in unloading the lower bowel of gas and fecal matter, thereby relieving the pressure occasioned by the intestinal engorgement. Minute doses of ipecac in peppermint water will aid in controlling nausea and vomit-

ing, as will the application of a mustard plaster over the stomach.

Repeated hypodermic injections to control pain is bad treatment; true it gives rest and comfort in distressed states, but it also masks the phases of the morbid condition to the
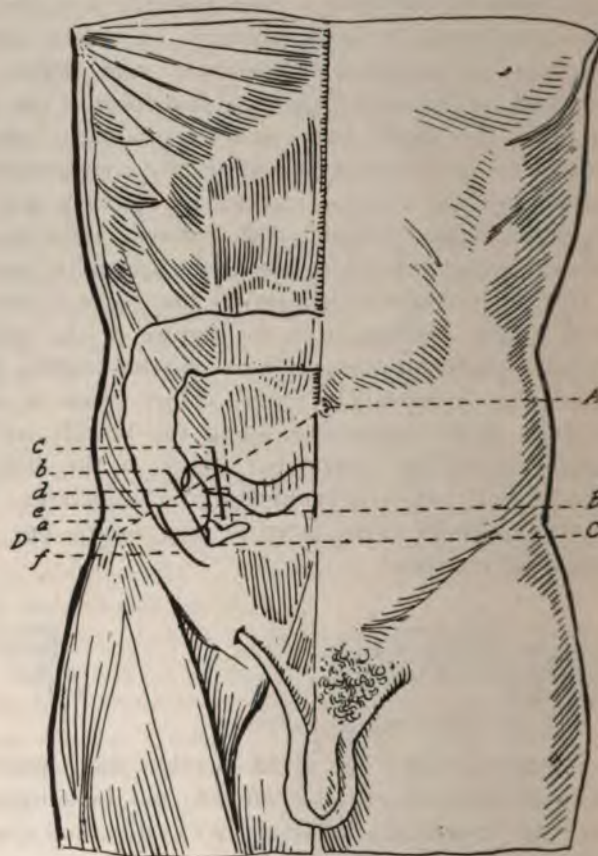
Fig. 115.—Lines of incision through the abdominal wall for the removal of the appendix. *A*, the umbilicus; *B*, the dependent portion of the cæcum; *C*, the appendix; *D*, the anterior superior spine of the ilium; *a*, linear incision in the mid-abdominal wall; *b*, linear incision midway between the outer side of the rectus muscle and the anterior superior spine of the ilium; *c*, linear incision two inches to the right of the outer edge of the rectus muscle; *d*, linear incision at the outer edge of the rectus muscle; *e*, linear incision in the middle of the rectus muscle; *f*, a slightly curved incision over and a little to the outer side of the dependent portion of the cæcum.

:tent that operative measures may be delayed beyond the
:riod when such procedures might save the patient.

In outlining operative procedures for the relief and cure of
)pendicitis, it may be said that ninety per cent will recover, if
ıe work is done within the first tweny-four hours after the
tack; beyond this period the risk to life increases as time
pses.

It may be questionable with some that a correct diagnosis
ın be made during the first few hours after the attack. Con-
dering that the disease has no premonitory symptoms of note,
ıd that the prominent characterictic features of the disease
·e sharp, localized pain, with tenderness over the appendix,
ith spasm of the right lower abdominal muscles, also a ten-
:ncy to flex the leg upon the abdomen, all of which present
rapid succession, there seems to be no reason to doubt the
)ility to determine the true condition within a few hours after
.e first symptoms appear.

There should be no objection to making an exploratory in-
sion early in the attack, and if conditions warrant, remove the
ıpendix at once, before ulceration and perforation or the for-
ation of pus takes place.

The operation, if done under proper antiseptic precautions,
certainly not extra-hazardous to life.

Determining upon operative measures, the successive steps
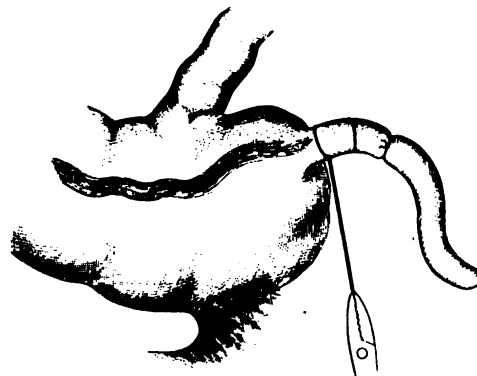
Fig. 116.—Appendectomy. The distal and proximal liga-
tures are placed to prevent hemorrhage and the escape of
bowel contents; the midddle line indicates the line of divi-
sion of the appendix. (*Bryant.*)

Fig. 117.—The illustration shows the appendix severed, a cuff of serous membrane turned back and a silk ligature placed and securely tied around the stump. (*Bryant.*)

in the procedure will be about as follows: After the preliminary antiseptic precautions have been completed, make a five-inch, oblique incision through the skin and superficial fascia over McBurney's point, about two inches and a half to the left of the anterior superior spine of the ilium and extending from about two inches above a direct line extending from the superior spine to the umbilicus, down toward the pubic region; separate these structures with retractors, and if possible, separate the underlying structures with the handle of the scalpel, except the peritoneum, which divide at the upper end of the incision to avoid any inflammatory adhesions that may exist. The small intestines are now walled off with sterilized gauze pads, when the cæcum will come into view, or can be quite easily located, if there are no adhesions to tie down the cæcal pouch. The appendix can be readily brought into the incision by elevating and rotating the cæcum outward. Once it is secured it is lifted up, its mesentery ligated near its base with catgut and again near the distal end and cut away with scissors; a ligature of silk or catgut is now thrown around the base of the appendix and securely tied, after which it is removed with scissors, leaving a stump of sufficient length to prevent its retraction from loosening the constricting strand.
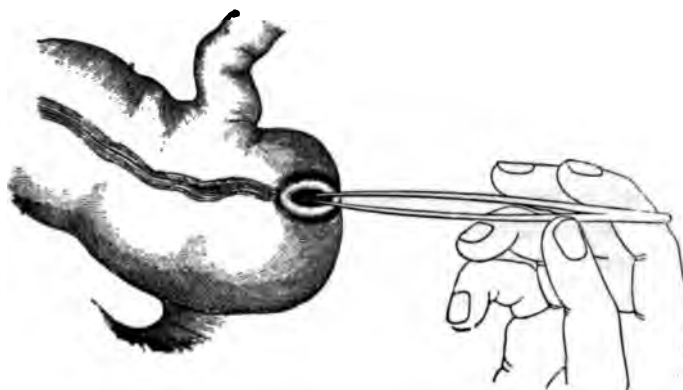
Fig. 118.—This illustration shows the stump of the appendix buried within the wall of the cæcum and the serous folds closing over it. (*Bryant.*)

he lumen of the cæcal stump is now cauterized with pure ıenic acid, wiped dry to prevent its spreading to adjacent ssue; after the surgical toilet of the cæcum and stump is ımpleted, they are replaced in the abdominal cavity, all ıonges and protective pads removed, a perforated rubber ·ainage tube, or a folded strip of iodoform gauze· adjusted to tablish drainage in septic cases, the overlying structures alwed to assume their normal positions and closed in the usual ay, using silk-wormgut sutures near the exit of the drainage edium; that the parts may be securely joined after the reoval of the tube, which will be in forty-eight hours, if all ıes well.

The external wound is dusted with boracic acid and bisuth and sterilized gauze pads applied and bound in place with ndages and left a week or ten days, when they are to be re-

Fig. 119.—The serous folds approximated and sutured with catgut over the stump of the buried appendix. (*Bryant.*)

moved and the wounded parts redressed. The patient should remain in bed about three weeks, when a soft pad should be applied over the site of the operative work and held in place with a band of muslin, to prevent the occurrence of hernia, if possible; this protective pad should be worn for several weeks, or until the divided structures are firmly united.

The above operative technic is to be followed in simple cases; complications must be provided for as they arise.

ABSCESS OF THE APPENDIX

As a result of traumatism and inflammatory disease of the appendix, abscess formations are frequently encountered in and near that organ. Inflammation of the appendix is generally due to occlusion of its lumen, with hardened fecal matter or other hard substance as bird shot or small bits of bone. Where the morbid action is severe, necrosis sometimes follows and purulent collections about the caudal-like organ results. Immediately following the inflammatory attack, especially if a slight perforation exists, adhesions more or less dense between the appendix and the adjacent structures often present serious complications to effecting a cure. Not infrequently portions of the omentum and intestines are found matted together in the abscess area, markedly increasing the hazardous conditions surrounding the case.

Abscesses in or about the appendix may form very quickly or they may be a long time developing, this will depend, of course, upon the nature of the cause producing them. Usually the purulent fluid soon becomes walled off from the adjacent tissue by adhesion; if not, the pus finds its way into the pelvic peritoneum, from which it spreads, eventuating in what is recognized as diffuse peritonitis. Such a result as this does not take place in those exceptional cases where the vermiform appendix is found outside of the pelvic peritoneal sac, except in cases where the purulent fluid sloughs through the peritoneal membrane, which is uncommon, as pus gravitates in the direction of the least resistance which, in this case, will be downward and generally forward; at least the purulent fluid will be found

in the inguinal region, back of the peritoneum and may extend uupward toward the kidney.

In the early stages of the disease, there will be tenderness and pain, more or less severe in character upon pressure over McBurney's point which is located on a line extending from the anterior superior spine of the ilium to the umbilicus, about two and one-half inches internal to the former point; besides the patient will experience rigors and hectic fever as soon as pus begins to form. Thirst and loss of appetite are marked features of the disease and the bowels are generally bound. The patient is much agitated at first, but later as absorption of pus takes place, a more tranquil state is experienced, but the features present a yellowish hue and the tongue coats over with a yellow fur, giving a sweetish taste to everything put in the mouth. The temperature that has been running from 101 to 103 degrees may now drop down to near the normal point and the pulse below a hundred and in some cases, the acute pain entirely subsides. In sub-acute cases where the formation of pus is slow, the tissues in the inguinal region become infiltrated and œdematous, both rather favorable indications that the purulent fluid is confined in the region of the appendix by inflammatory adhesions.

Treatment: The treatment of appendicular abscess, consists in evacuating the purulent fluid through an incision some three inches in length extending upward and a little outward from the middle of Poupart's ligament. The dissection down through the tissues is done with the knife and groove director, separating the tissues without cutting, when possible. The exact pus cavity is often located after getting well down through the tissues with an aspirating needle, indicating the direction that the incision should extend. After pus has been turned out, the abscess cavity should be cleared by irrigating with warm borax or salt solutions, after this, search for the appendix; if found, it should be removed.

Provisions for drainage should be made before closing the external wound. The external dressings should consist of sterile gauze pads of sufficient size to make slight pressure over the suppurating area when held in place with several turns of a spiral bandage.

During the time suppuration is in progress, the patient should have such remedies as will whip up the appetite and give tone to the system. For this purpose iron, small doses of quinia, the lime salts, and mineral acids will be demanded, and the most nourishing foods should compose the diet.

FOREIGN BODIES IN THE STOMACH

The swallowing of foreign bodies that find permanent lodgment in the stomach which the gastric fluids are incapable of disintegrating, is of quite common occurrence, especially with children and persons of unsound mind. It is usually considered that any foreign body that can pass through the esophagus will eventually be expelled from the bowels; this rule may hold good with any but fish-bones, pins, nails, hair-pins, pieces of glass and other jagged bodies of like nature. Wads of hair and bits of cloth are also likely to remain in the stomach for a long time unless removed surgically. In most instances these bodies are accidently swallowed, while on the other hand the rash act is committed by felons and others with suicidal intent.

The symptoms commonly observed in these cases are pain and distress in the stomach accompanied with digestive disturbances; nausea and vomiting are not unusual and the passage of bloody stools has been known to occur as a result of injury to the mucous membrane.

In cases where the symptoms are indefinite making the diagnosis obscure, the presence of the solid body in the stomach or even in the intestines may be located by the X-ray.

It is the rule with some surgeons not to operate unless severe symptoms occur; with others the nature of the object swallowed will at once suggest the course to pursue; if sharp or roughened pieces of metal are lodged in the stomach a gastrotomy should be done without delay.

INJURIES TO THE SPLEEN

The spleen is frequently ruptured from external violence displayed against the wall of the abdomen, as kicks, blows, or by falling against some hard object. The symptoms following the injury are nausea, vomiting, pain in the left side, shock,

rapid, feeble pulse, collapse, soon ending in death, in cases of extensive lacerations followed by active hemorrhage.

Treatment. The treatment of lacerations of the spleen is entirely surgical and the character of the wound is such as to demand immediate action following the injury. Small lacerations are sutured with catgut and, in placing the sutures, a good wide bite should be taken and care exercised not to draw the loop so tight as to cut through the friable tissue. The sutures are best introduced with a curved needle fastened in a handle, similar to the one fashioned by Emmett. After the required number of sutures are placed and tied, the traumatic surfaces are held snug enough to control oozing of blood.

Extensive lacerations will require removal of the spleen (splenectomy), in most cases, a heroic operation that gives a death rate of thirty per cent under the most modern methods of procedure. The successive steps in splenectomy or extirpation of the spleen are briefly as follows: after the patient is prepared for the work and anæsthetized, a liberal incision is made in the median line extending from the ensiform process to a point three inches below the umbilicus, or, if the operator prefers, the incision can be made along the line of the left semilunaris: in either case the incision is carried down through skin, fat and muscular tissue to the peritoneum, which is picked up and divided between thumb forceps to the extent of the external wound. As soon as the spleen is recognized, it is drawn well into the abdominal incision, unless the vascular organ is anchored by inflammatory adhesions: in this case, the restraining bands of tissue should be dissected away with the finger, unless they are found to be of considerable size, when they should be divided between two ligatures, care being taken not to wound the capsule of the spleen, otherwise troublesome hemorrhage will ensue.

The peritoneal folds that connect the spleen with the stomach and the gastro-splenic omentum will offer some resistance to dislodging the spleen from its normal position, but by gradual traction the organ can be brought far enough forward to expose its pedicle, which is composed chiefly of the gastro-splenic omentum, including the splenic vessels. As soon as the bearings of the organ are ascertained, the pedicle is transfixed with

a blunt-pointed ligature carrier, armed with a stout braided silk strand, which is cut at the eye of the needle, leaving two ligatures, for each lateral half of the pedicle, which is then securely tied, care being taken not to include other adjacent tissue within the loop of the ligature. Any other ligamentous structure found attached to the spleen, likely to contain blood vessels, should be divided between ligatures and afterwards inspected for bleeding points. After the pedicle is securely tied in halves and severed close to the body of the spleen, the ends of the large blood vessels in the stump should be sought and, if found, their ends should be tied separately.

The ends of the ligatures that secure the pedicle in halves should not be cut until all of the operative work is finished on the tissues annexing the spleen to the adjacent organs; this completed, the stump is once more carefully brought into view by making traction on the long ends of the constriction cord and, if there be no oozing of blood, they are cut close to the knot. The abdomen is then cleaned of any debris resulting from the operative measures and the abdominal wound closed in the usual way without any provision for drainage.

Abscesses sometimes form in the tissues of the spleen, following injuries to this organ from external violence. The symptoms are not unlike those that present in abscess of the liver and the treatment should be along the same line that is advised in the treatment of that morbid state in the liver. The early symptoms of the accumulation of pus are rigors and hectic fever, headache and thirst in connection with tenderness over the vascular organ, often attended with nausea and vomiting. Palpation may determine quite early the location at which the purulent fluid seems to point, but to determine this feature of the morbid condition beyond doubt the exploring needle should be introduced; if pus is found, the patient is prepared and the region of the abscess opened up (splenotomy), the pus evacuated and the cavity cleaned with gauze sponges and then packed with iodoform or plain sterile gauze, one end of which extends out of the external wound which is now closed with silk-wormgut sutures, leaving a little space through which the packing is removed a day or so later. The subsequent treatment will depend largely upon developing conditions, if there be no further ac-

cumulations of pus, the abdominal incision is dressed without drainage and the patient placed at rest in bed. If symptoms of septic fever manifest themselves, potent doses of echinacea or baptisia should be administered in alternation with such other remedies as the condition calls for.

The nourishment should be taken in small quantities for three or four days and should comprise soups, broths, custards, ice cream, lemon or pineapple ice, taken with plain sponge cake. As the patient improves, a more substantial diet may be taken. The bowels should be kept open with broken doses of sulphate of magnesia and the function of the kidneys looked after.

Splenopexy is sometimes performed to give relief from pain and the dragging sensations experienced in cases of dislocation of the spleen, when bandaging and the wearing of a corset fail to relieve the distress.

Women are more liable to have a "wandering spleen" than are men, especially those females who have borne children.

The diagnosis is determined principally by palpation and manipulation, thus outlining the oval organ in its abnormal position.

The operation has for its purpose the fixation of the organ to the overlying abdominal wall, which is done through a vertical incision made in the median line; the surface of the spleen then being brought in contact with the peritoneum and secured by numerous catgut sutures, which are later followed by inflammatory adhesions of sufficient strength to prevent a recurrence of the displacement.

The operative work is done under strict antiseptic precautions. The results are usually good in favorable cases, and the operation is much safer than splenectomy. Should adhesions be encountered between the spleen and the adjacent organs, they must be separated or incised before suturing the organ to the abdominal wall.

ECTOPIC SPLEEN

A displacement of the spleen is mainly due to a lax condition of the gastro-splenic ligament and as a consequence, the splenic vessels also, become abnormally elongated. To the extent of

the elongation of the sustaining ligaments, the spleen will wander about in the peritoneal cavity.

The displacement of the organ is not uncommon in middle life and is observed in women more frequently than in men; frequent child-bearing is given as a probable cause of the prolapse. Men who are engaged in occupations requiring heavy lifting and other strenuous work are subject to a displacement of the vascular organ.

The diagnostic symptoms attending a wandering spleen are the absence of dullness upon percussion over the natural position of the organ and the location of a movable tumor-like mass at some point lower down in the abdominal cavity, and a dragging unpleasant feeling in the left hypogastric region upon the least exertion. If the spleen is enlarged and sinks low in the abdominal cavity, the dragging upon the stomach often excites gastric disturbances manifested by nausea and sometimes vomiting. Functional disturbances of the bladder and intestines sometimes occur as a result of pressure when the enlarged organ sinks low down in the abdomen. Adhesions may be found between the spleen in its natural location and the adjacent structures which, of course, will have to be separated before any form of treatment can possibly be effective. Bowel obstruction or bladder pressure will often mask the splenic displacement, the painful symptoms being directed solely to these organs.

Treatment: The treatment of wandering spleen consists in replacing the organ in its normal position and maintaining it there by having the patient wear a reasonably sized pad, composed of cotton or wool, covered with gauze and placed just below the spleen, over which and around the body, a binder eight or ten inches in width is adjusted and secured by safety-pins. This form of dressing may answer well in individuals who are rather spare built, but fails to accomplish the desired end, in persons of full habit of body. It will be advisable for the patient to spend much of the time in bed, while under this form of treatment.

Anchoring the spleen to adjacent tissue is advised by many surgeons of advanced experience, in cases where the organ is not markedly enlarged, otherwise it should be removed (splenectomy.)

Rydygier's method of fixation is as follows: After the patient has been properly prepared, an incision is made in the median line of the abdomen, extending downward some eight inches or more, from a point near the ensiform cartilage; after dividing the soft structures down to the peritoneum, all bleeding vessels are picked up and pinched or ligated to check hemorrhagic flow. The peritoneum is then opened to the extent of the incision in the overlying soft tissues, and the margins of the wound then fully retracted, exposing the normal location of the spleen. Next make a transverse, slightly curved incision through the parietal peritoneum of sufficient length to form a pocket of the peritoneal flap, when the same is separated from the abdominal wall. Care should be observed in making the incision in the peritoneum to have the convexity pointing upward and the flap is separated down far enough that when it is pulled away from the parietal muscles the pocket or pouch will be sufficiently large and deep enough to accommodate at least the lower half of the spleen, where it is secured by inserting several interrupted silk or catgut sutures, which pass through the margin of the peritoneal flap and the gastro-splenic omentum. It is advised to insert two or three silk sutures immediately beneath the peritoneal pocket, fastening the peritoneum to the abdominal wall to prevent the heft of the spleen from sinking deeper into the pocket and separating the peritoneum to a greater extent from the overlying structures. The sutures are placed from within the abdomen after the left parietal wall is well retracted and held outward by an assistant. It is possible to obtain further adhesions between the spleen and peritoneal membrane by excoriating the opposing serous surfaces of the spleen and pariteal peritoneum by scraping them slightly with a scalpel or rubbing them with a dry gauze sponge.

After cleaning the abdominal cavity of operating fluids and removing previously inserted pads, the external wound is closed with silk-wormgut sutures without drainage.

The patient is placed at rest in bed where he should be kept for at least four weeks to insure firm union between the vascular organ and the adjacent tissues. A bandage should be worn for some months following the recovery from the operation.

In cases where the spleen is markedly enlarged and displaced, where the ligaments are long and lax, a removal of the organ is the one course to pursue. A splenectomy should be executed.

ABSCESS OF THE SPLEEN

Abscess of the spleen is not of common occurrence, but when it does occur it is generally due to one of two causes, traumatism or to the deposit of cacoplastic material, resulting from some form of systemic disease of an infectious nature. The morbid condition has been observed in connection with pronounced malarial attacks, typhoid fever, specific disease, and smallpox. It will sometimes result secondary to a collection of purulent fluid in some nearby structures, as the bowels, liver, or their adnexia.

The diagnosis is not always clear, but the local tenderness and pain with sometimes rigors and hectic fever, with muscular rigidity in the left side, all point to splenic abscess. The morbid condition should be differentiated from chronic pleurisy, pleural adhesions, and tumors of the spleen. The abscess is usually single, although the condition may be multiple. The development may be slow or rapid, depending, of course, upon the cause of the disease.

Treatment. The treatment of the morbid disease should be either by incision or excision; the former course being preferred in cases where the abscess is single, and the latter course where the disease is multiple. The technic of either of these operations is quite fully described under their separate heads, splenectomy and splenotomy.

UMBILICAL FISTULA

Umbilical fistulæ are occasionally met with and are as a rule congenital. The fistula is usually urinary, although a fecal fistula is occasionally encountered. The former is due to an unclosed urachus, while the cause of the latter may be traced to a wrong of development of the rudimentary intestinal duct. The morbid condition is manifest from the birth of the child, and

while the opening is small, yet the discharge is sufficient to soil
the dressings and create an offensive odor; in fact, the latter
will, in the majority of cases, disclose the character of the fis-
tula.

Treatment. The treatment should aim to effect a complete
closure of the open canal; this can be done in two ways, by the
application of pure carbolic acid to the outer half-inch or more
of the fistula when the opening is small, and the isolation of the
outer portion of the fibrous canal by dissection, applying a liga-
ture, after which the liberated portion is cut away. If the former
course is resorted to, three or four applications are usually suffi-
cient, with an interval of two days between the treatments. The
acid can be introduced within the opening of the duct on a
wooden toothpick. As soon as the granulations appear the ap-
plications should cease.

In cases where the fistula is exceptionally large and extends
deep within the abdomen, connecting, perhaps, with some in-
ternal cavity, to effectually reach and close the duct a laparo-
tomy will have to be resorted to, which should, for valid rea-
sons, be deferred until the child is a year or more of age.

The subsequent treatment should be based upon the course
usually followed in abdominal operations.

ULCERS OF THE INTESTINES

Ulcers of the intestines are due to many causes, chief of
which may be mentioned dysentery, typhoid fever, tuberculosis,
syphilis and obstruction of the bowels from whatever cause. It
is not the simple form of the disease that is brought to the at-
tention of the surgeon; not till symptoms of perforation super-
vene are his services asked for as a rule, and as the compli-
cation does not generally appear until about the third or fourth
week in typhoid fever, the physical condition of the patient is
anything but favorable for the execution of operative meas-
ures for relief from the perilous state.

In the majority of cases, the lesion occurs in the small
intestines; more frequently in the lower section of the ileum
than in other portions of the bowel. The perforations are ex-

ceedingly small as a rule, and the lesion may be single or there may be several perforations within a small area of the gut.

Rigidity of the abdominal muscles, distention of the abdomen, together with tenderness and pain, are symptomatic indications of perforation, but often these symptoms are obscure, being in a great measure masked by the other morbid conditions present peculiar to the fever. Immediately following the perforation, nausea and vomiting supervene, and the pain and tenderness are more intense; the patient is restless and the pulse is rapid and weak. It is not uncommon for the temperature to drop suddenly to normal or below and the patient to pass gradually into a state of collapse. Unless relief is obtained promptly through operative measures, the patient will not long survive the grave condition.

Treatment. As previously stated, the condition of the patient at this period of the disease renders operations of the nature required in cases of this kind extremely hazardous; nevertheless, prompt relief through a laparotomy and closing of the necrotic opening by turning in its margins without trimming, and uniting the opposing serous surfaces by the mattress sutures, using fine iron-dyed silk or fine catgut for the suture material, should be done. The placing of the sutures is often more or less difficult on account of the friability of the tissues surrounding the ulcer. If this condition is pronounced, the diseased area should be removed and an end-to-end anastomosis executed. Where this is not feasible, relief may be obtained by doing an enterostomy. Before closing the abdomen, other perforations and diseased areas that are likely to give trouble later should be sought for and, if found, such measures should be adopted as the nature of the conditions require.

On account of the patient's weakened condition, great care should be exercised in the administration of an anæsthetic, and everything should be previously arranged that the operative work may be speedily done.

Nitrate of strychnia should be hypodermically administered one hour before giving the anæsthetic, and added stimulation should be employed during the time of the operation, even to the use of hot normal saline solution, intravenously administered.

After closing the perforations in the bowel, the waste matter

should be quickly sponged out with gauze pads wet in hot saline solution and, if necessary, the ventral cavity may be flushed with the same before closing the external wound.

The abdominal incision should be closed with silk-wormgut, each suture including the entire structure of the marginal incision. Provision for drainage needs to be arranged for only in extreme cases of peritoneal involvement of an infective nature.

Seldom do perforations occur following an attack of dysentery; the system becomes depleted as a result of the frequent mucoid discharges, and hemorrhages from ulcerated patches occurring in the colon. In such cases as fail to yield to the judicious use of remedial agents, a colostomy should be performed after the patient has been prepared for the work. In extreme cases, the life of the patient has been saved by removing the diseased portion of the colon.

Ulceration following the presence of foreign bodies in the intestinal track should be closed in the same way as was the perforating ulcer in typhoid fever, if small, or by the Lembert interrupted suture, or the continuous suture, after removal of the object causing the injury leaving a larger opening.

Ulcers occurring in the duodenum are generally due to chronic digestive disturbances and are similar in character to the peptic ulcer of the stomach. It is after perforation occurs that serious symptoms arise, requiring surgical interference.

Owing to the great liability of ulcers located near the pylorus terminating in malignancy, operative measures should not be long delayed, once symptoms of perforation become manifest, the most common of which are tenderness and pain in the region just below the stomach, which become more intense an hour or so after eating, nausea and often vomiting; distension of the upper part of the abdomen indicating irritation of the peritoneum; the bowels are usually bound and the patient exhibits a continued restless state of mind and body.

If, after a period of treatment of the morbid condition with bismuth and carbo. veg., hydrastis, carbonate of magnesia, and nit. of silver, with an exclusive milk diet at the outset, the morbid state recurs, the abdomen should be opened and the diseased area sought for: if found near the pylorus, and severe in character, either a pylorectomy should be executed or a gastro-en-

terostomy, as will be best suited to the conditions present. The technic of these operations is given elsewhere in this book.

A case presenting strong indications of stenosis when first examined should be operated on at once, as no relief can be expected from medicinal treatment.

INTESTINAL OBSTRUCTION

Obstruction of the intestinal canal is frequently met with, and the causes are numerous. The morbid state is divided into two varieties, the acute and chronic form. The former is caused by intussusception, strangulation, foreign bodies, and a twist in the intestine. The small intestine is the portion that is generally obstructed by some one of the causes mentioned, although it may result from paralysis and is a condition of congenital occlusion.

The chronic form of obstruction is generally located in the large intestine, and is due to strictures following ulceration of the mucous surfaces; dysentery, fecal impaction, and the presence of abscesses or tumor formations. More cases of obstruction result from the impaction of feces than from any two of the other causes combined.

Serious symptoms often speedily develop in the acute form and terminate fatally in most cases if not quickly relieved. The localized pain in most cases is intense. The features are anxious, the pulse quick and feeble; vomiting is an early symptom, first of ingesta and later a greenish fluid having a fecal odor. Frequent urination indicates that the obstruction is rather low down in the intestinal tract. The abdomen soon becomes tympanitic and marked tenderness is manifested on percussion and a continuous gurgling sound heard throughout the abdomen. Obstinate constipation is a characteristic feature of the morbid condition in both the acute and chronic forms; in the former it appears suddenly and is complete, while in the chronic form it comes on gradually, the discharges containing more or less mucus, sometimes streaked with blood.

When called to a case of suspected bowel obstruction and the cause is obscure, which it is in many cases, the regions where

hernias are prone to occur should be carefully examined for a possible incarceration of a knuckle of intestine, which, if found, should be liberated through an incision in the soft parts over the protruding mass at once.

The form of treatment that should be adopted in these grave cases will depend altogether on the cause producing it. There are preliminary steps that should be adopted in all cases of suspected obstruction. The bowel should be unloaded with a high enema of turpentine, a drachm; glycerine two ounces; warm water one to two pints. Give no physic, and withhold all food for a day or two, keeping the patient at rest in bed. To relieve the accumulation of gas on the stomach, sips of hot peppermint water should be frequently taken. Pain can be assuaged with an eighth to one-sixth grain of heroin or morphine and atropia when conditions will justify their use.

The enema of glycerine and water will aid in removing impacted feces.

Marked cases may require the use of a scoop to clear out the lower part of the bowel which can be fashioned out of the handle of a spoon if no better instrument is at hand. Copious enemas of warm salt water and the insufflation of air in the lower bowel should first be faithfully tried in other forms of stoppage of the bowel; if this fails to bring relief the abdomen had better be opened at once and the intestinal canal searched for the obstruction.

If gall-stones or other foreign bodies are found to be the obstructive medium, they should be removed at once through a longitudinal incision in the intestine, which is then closed with Lembert's sutures, using iron-dyed silk as suture material. If the bowel has become damaged at the site of the obstruction, through pressure of the foreign substance, the incision should be made a little above or below the plugged area, or a section removed, if ulceration has damaged the bowel to any great extent, and the divided ends united with a Murphy button or some one of the other recognized methods of anastomosis.

When in doubt as to the cause of the obstruction, a resort to laparotomy should be advised while there is a reasonable chance for the patient to recover. The mortality in young children with obstruction of the bowel when due to intussus-

ception is great, unless relieved in the early stages of the attack by injections or by operative measures.

In chronic cases there may not be the necessity of resorting to operative measures so early in the attack as there is in well marked acute cases; however, a delay in such cases often hazards the life of the patient by the affected area becoming bound to adjacent parts by inflammatory adhesions.

In cases caused by malignant disease of the rectum or sigmoid flexure, an inguinal colostomy, forming an artificial anus, offers the safest solution of the morbid condition.

Stricture of the small intestine causing the obstruction will call for an excision of the affected portion or the performance of enterotomy, which will at least give temporary relief. The operation is done as follows: after the patient has been prepared in the usual manner and placed under an anæsthetic, an incision about three inches in length is made about one inch above and parallel to Poupart's ligament, and extending from a point near the anterior superior spine of the ilium to a line opposite the internal abdominal ring. The soft structures are divided down to the peritoneum, which is picked up with dressing forceps and incised to the length of one and a half inches or more. Usually a loop of distended bowel will at once present in the gaping wound. It should be seized with forceps and drawn well out of the abdominal incision and fastened to the borders of the skin with silk sutures; next, the extremities of the external incision on either side of the loop are united with silk-wormgut sutures, the two next to the intestine passing through the entire parietal tissues and peritoneal and muscular coats of the intestine. The loop of intestine is then united to the margins of the skin by interrupted silk sutures placed about one-eighth of an inch apart, care being taken not to go deeper than the muscular coat of the bowel. The loop is then surrounded with a strip of sterile or iodoform gauze close to the skin, to protect the suture line from infection when the bowel is excised, which should next be done to the extent of about three-quarters of an inch in its long axis. The after-dressing should be directed to keeping the wound clean with antiseptic and sterile gauze dressings, while the wound in the abdomen is healing.

In cases where the surgeon is in doubt regarding the lo-

cation of the obstruction, there is no valid reason why the exploratory incision should not be made in the median line between the umbilicus and the symphysis pubis, bringing the presenting distended loop of intestine into the wound and forming an artificial anus as directed in inguinal enterotomy.

PERFORATION OF THE INTESTINE

Perforation of the intestine often occurs as a result of ulceration, which takes place in connection with tuberculosis of the bowel, dysentery, syphilis, typhoid fever, malignant disease and several other affections destructive in character. It is the desire of the author to note the symptoms, course and effect of typhoid perforation of the bowel in this article and the treatment likely to bring prompt relief in cases where the general conditions of the patient will permit of its execution.

The perforation generally takes place in the ileum and may occur at any time between the second and tenth week. It generally occurs at about the third or fourth week and is attended by tenderness and pain, muscular rigidity, nausea and often vomiting. The morbid process may occur in two or more places at about the same time. The lower part of the ileum is the common point of attack, although the ulcerative action may occur at other portions of the alimentary tract higher up.

The perforation is generally very small and usually occurs near the mesenteric attachment. The immediate surrounding tissue is found to be puffy or infiltrated and exceedingly friable.

One of the early symptoms of perforation is a fall of the temperature, accompanied by marked physical weakness and a rumbling of gas and, in some cases, the gurgling of fluid in the abdominal cavity; the pulse will be found weak and rapid and the respiration hurried; restlessness is usually a feature of this stage of the morbid condition. Peritonitis soon follows the perforation and is a characteristic symptom to be considered in forming a diagnosis.

Treatment. The treatment best suited in perforation of the bowel is, in the main, surgical. True, the morbid condition occurs at a time when the physical condition of the patient is

illy prepared to withstand the severe shock attendant upon a laparotomy and closure of the perforation, and in many cases the operative procedure should not be attempted, owing to the fatal tendency of the work. Such cases as the surgeon presumes to operate upon, should be hurriedly prepared by stimulating the patient with intravenous injections of normal saline solution, and strychnia hypodermically administered, immediately preceding the administration of the general anæsthetic, which should not be given until the patient has been prepared for the work and everything arranged for a speedy operation. The abdomen is then opened in the median line and the ulcer sought for and closed with iron-dyed silk, using the mattress form of suture after inverting the margins of the ulcer and as much of the wall as seems to be reduced by the ulcerative process. The abdominal cavity is next cleansed with quite warm sterile salt solution, when the ventral wound should be quickly closed with silk-wormgut sutures, each of which includes the whole structure of the abdominal wall. This accomplished, a bandage should be comfortably adjusted and the patient made as comfortable as the circumstances surrounding the case will permit.

It is possible to execute the operative work under the influence of local anæsthesia where, for valid reasons, a general anæsthetic would be unsafe. A four per cent solution of novocain or cocaine, to which a few drops of a solution of adrenalin chloride is added, makes a potent mixture for the purpose.

By timely operation it is possible to save from twenty to thirty per cent of these cases, where only about five per cent are saved when other forms of treatment are relied upon.

TUMORS OF THE INTESTINE

Tumors, both benign and malignant, are often found springing from the walls of the small and large intestines. It has been the observation of surgeons of large experience that cancer is more likely to attack the colon than the small intestines, while the latter is generally the seat of sarcomata and cystic

growths, although the latter seldom develop to the size that great physical distress is provoked by their presence.

As the anatomical structure of the bowel is composed of fibrous, mucous, fatty, and lymphatic tissue, such forms of morbid growth as are prone to spring from such tissue are occasionally found in the intestinal track.

As a rule, nonmalignant growths develop slowly and seldom give any physical indications of their presence until the lumen of the bowel is encroached upon sufficiently to threaten obstruction.

Malignant growths are generally attended with digestive disturbances, mucoid discharges, nausea and vomiting, distress and pain, pale features, and a progressive loss of weight.

Sarcomata generally make their appearance in early adult life, although they may appear at any age. The growth may appear as a distinct tumor, assuming somewhat the shape of a polypus or the entire walls at the site of the affection may become involved by infiltration of the intestinal tissue. Its development is generally rapid and its effect upon the system very depressing. Cancer, on the other hand, generally makes its appearance after middle life and through its destructive character constricts the bowel at the site of attack. Both varieties of malignant growth will spread to, and involve the surrounding structures in the advanced stages of the disease.

The symptoms attendant upon morbid growths in the intestines vary in accordance with the location of the tumor, and the stage of its development. Generally the first evidences of a malignant tumor are nausea, vomiting, distress on pressure, pain and irregular bowel action due to a certain degree of obstruction. There may also be present a jaundiced state of the skin and a marked loss of strength and flesh. The jaundiced condition is generally due to involvement of the bile duct or the duct of the pancreas in the growth.

Nonmalignant tumors, as a rule, only give pressure pain and disturbance of bowel action by obstructing the intestine. The presence of the tumor mass may often be determined by palpation.

The sigmoid flexure and the cæcum are common sites for malignant growths and their development here is both rapid

and destructive. The lumen of the bowel above the constriction is always distended from the accumulation of flatus and fecal matter; for a time this may be removed without much difficulty by laxatives and enemas, but at a later period this form of treatment only serves to aggravate the morbid condition by increasing the peristaltic movements of the bowel.

Malignant disease of the intestines usually breaks down in ulceration in the last stage of the affection, perforation usually following, which not infrequently provokes suppurative peritonitis with a tendency toward a fatal termination.

There are other morbid conditions of the bowels, the character of which, in many ways, simulate those of malignant disease, and from which it will be well to differentiate when possible. Syphilitic growths may be mentioned as one of these affections, and tuberculosis of the intestine another; the latter, as a general thing, having its primary point in the mesenteric glands of the bowels and generally encroaching upon and involving the bowel itself in the tumor-mass.

Treatment. The treatment of tumors of the intestine is entirely surgical, and the growths should be excised, when feasible, as soon as the character of the ailment is fully determined, and before obstruction of the bowel occurs and the lymph glands in the adjacent tissue become involved. After the growth is removed an end-to-end anastomosis is made, the technic of which is fully given under the head of Intestinal Anastomosis to which the reader is referred.

In advanced cases of malignant disease, when the disorganized area cannot be removed with safety to the patient, a union of a portion of the intestine above the tumor to a portion a suitable distance below it will, when feasible, immediately relieve some of the conditions that give rise to distress and pain and threaten a rapid dissolution of the patient. When the disease is located in the sigmoid flexure, an inguinal colostomy is the only feasible operation to bring relief, and this, in the large majority of cases, will be of short duration, as the progress of the malignant disease will, within a short time, result in a fatal termination.

Nonmalignant growths of the bowels give little trouble to the patient until obstruction is threatened. They should then

be removed by excision in case of solid tumors and incision and drainage if required, in cystic formations.

To maintain the patient's strength, tonic and stimulating remedies should be administered, together with a diet composed of rich and nutritious articles of food. An out-door life will contribute much to the welfare of the patient.

ACTINOMYCOSIS OF THE INTESTINE

Actinomycosis of the intestine is due to a local infection set up by the **ray fungus,** taken into the system with food containing the bacilli. It is thought that the bacilli is more apt to be conveyed into the system through a vegetable diet than a diet of meat.

Once the bacilli finds entrance into the intestinal track, the mucous membrane is soon attacked and later the muscular coat of the bowel, the small areas of invasion soon undergo degenerative changes that soon eventuate in ulceration, more or less severe in degree.

In the early stages of the disease, the walls of the intestine become thickened from infiltration of the surrounding structures with serum, and following the ulcerative process, dark scar-tissue marks the point of attack.

The cæcum is a common seat of the disease and the rectum, stomach and liver are portions of the abdominal viscera, frequently attacked.

Usually the onset of the disease is sudden, a diarrhœa first appearing, generally accompanied by nausea and sometimes vomiting. Pain and tenderness on pressure are common symptoms of the local disease and when located in the cæcum, is often diagnosed as an attack of appendicitis. Soon the infected mass assumes a size easily outlined through the abdominal wall. At first the tumor is quite dense but later, as degeneration advances, it softens; the overlying abdominal walls becoming involved, soon assume a pale violet color, through the center of which, a fistulous opening often occurs, discharging a thin, straw-colored fluid, often containing granular bodies, composed of detritus or broken down tissue and actinomyces. The fistula will remain

open indefinitely, there being no disposition of the tissue to heal, unless, through operative measures, the primary point of infection be removed.

Treatment: In individuals of great resisting power, it is possible for the morbid condition to yield to the forces of nature and heal, otherwise the affected area should be resected, when possible, or as much of the diseased area cut away as the nature of the case will permit of, and such remedies administered internally, as will retard the progress of the disease and peptics and tonics given together with rich nutritious food to build up the system. To accomplish these ends, such remedies as iodide of iron, arsenic, phosphorus, iodide of potassium, olive oil, and the lime salts are advised taken in quantities to meet the indications as they may appear in each individual case.

The diet should include eggs prepared in various ways, rich soups, milk and cream, well cooked pickled pork, thoroughly cooked pickled pigs feet, custards, fowl and fish. The patient should live mostly out of doors but avoid exposure as much as possible.

INTESTINAL ANASTOMOSIS AND CAUSES LEADING UP TO IT

Of special interest to the surgeon are diseases and injuries to the intestines and the operative methods in vogue for the successful treatment of the same.

One of the most common ailments of the intestines, often requiring a resort to surgical measures to save the life of the patient, is perforating ulcers. Ulcers of the stomach and upper intestinal canal usually appear during middle life in persons who have for years suffered from some of the severe phases of dyspepsia. During the early stages of this form of ulcer the patient complains of gastric uneasiness much of the time, which is made worse by eating; there is active hemorrhage from the ulcer occasionally, and when the open sore is located in the stomach or in the duodenum near that viscus, severe epigastric pain will often be experienced attended with nausea and sometimes vomiting. Not infrequently the pylorus becomes involved

to the extent that a pylorectomy is required to relieve the mor-
bid condition caused by the resulting stenosis. Operative meas-
ures should be resorted to after remedial means have failed to
give lasting benefit and before the patient lapses into a state
of anemia and physical exhaustion.

It is estimated that one case of perforation occurs in every
ten cases of chronic indurated ulcer located in the stomach or
duodenum.   ,

The ulcer soon becomes exceedingly painful, after involving
all of the coats of the organ, and the tissues surrounding it are
found congested and edematous; and as the lumen of the pylorus
becomes occluded through the inflammatory action and its re-
sults, the stomach gradually dilates, giving rise to pain and dis-
tress, nausea and vomiting, bad breath, and a gradual loss of
flesh and strength. This form of ulcer frequently terminates in
cancer.

As previously remarked gastric and upper intestinal ulcers
become of interest to the surgeon, if not relieved by remedial
measures, within a few weeks.

Where the pylorus is involved, a gastro-enterostomy should
be advised, which may be quickly done with a Murphy button
and also quite successfully executed by removing the pylorus
and as much of the adjacent intestine as is involved in the ulcer-
ative state, and then joining the end of the gut to the pyloric
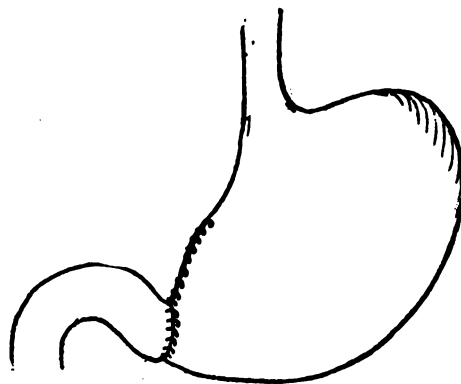
Fig. 120.—Pylorectomy, (*Billroth's* method). The dis-
eased portion has been excised and the end of the duodenum
sutured to the end of the stomach. (*McGrath.*)

end of the stomach after narrowing the opening in the viscus to the size of the upper extremity of the duodenum to which the union is to be made.

The technic of the end-to-end anastomosis is briefly as follows; after the bowels have been emptied with a saline cathartic and the stomach washed clean with a weak saline solution, and the patient otherwise prepared as for laparotomy, chloroform should be administered, after which an incision should be made in the median line extending from a point near the ensiform process downward toward the umbilicus to the extent of six inches or more, dividing the soft structures down to the peritoneum, which should not be opened until hemorrhagic points are picked up and secured by torsion, compression, or ligature. The serous membrane is then divided between thumb forceps and extended to the length of the wound in the overlying structures. Strict antiseptic measures should mark every step of the operative work as upon these precautions much of the success of the operation depends.

The stomach should be sought for after the wound is walled off with hot sterile gauze pads, and its surface traced to the pyloric end of the organ; if adhesions exist they should be separated, broken up, or divided between ligatures as seems best to the operator.

The upper portion of the duodenum and the pyloric end of the stomach should next be brought out of the abdominal wound as far as convenient, the great and small omenta cut close to the greater and lesser curvatures of the stomach, after securing the vessels between double ligatures as far back on the organ as the incisions are apt to extend, caution being exercised not to injure the transverse mesocolon, portal vein, hepatic artery and the common bile duct found lying behind the pylorus. The pylorus and as much of the adjacent duodenum as is involved in the ulcerated area is next cut away with scissors, and the end of the duodenum plugged with cotton, sponge, or gauze strips. At this stage of the operation the sterile pads surrounding the parts involved in the operative procedure should be removed, and fresh ones substituted. The opening in the stomach should now be narrowed on the upper or lesser curvature side with iron-dyed silk, by the Lembert form of suture, which

should be placed with a medium-sized round milliners' needle to the size of the duodenum with which it is to be united, also by the Lembert suture; curved needles should be used to unite the inner surfaces, and straight ones to unite the peritoneal coats. The sutures should be so placed that when they are tied no puckering of the surfaces will exist. To insure against leakage, a second row of sutures should be placed, including the serous and muscular coats only; following which the parts should be thoroughly cleansed with sterile gauze sponges, and the organs replaced in their original positions and the external wound closed in the usual way.

Instead of making an end-to-end anastomosis between the stomach and duodenum after the removal of the pylorus and ulcerated portion of the intestine, the end of the intestine may be united with an opening made in the posterior wall of the stomach the size of the severed end of the duodenum. After the opening in the end of the viscus has been closed with a continuous silk suture the closed margins are then invaginated
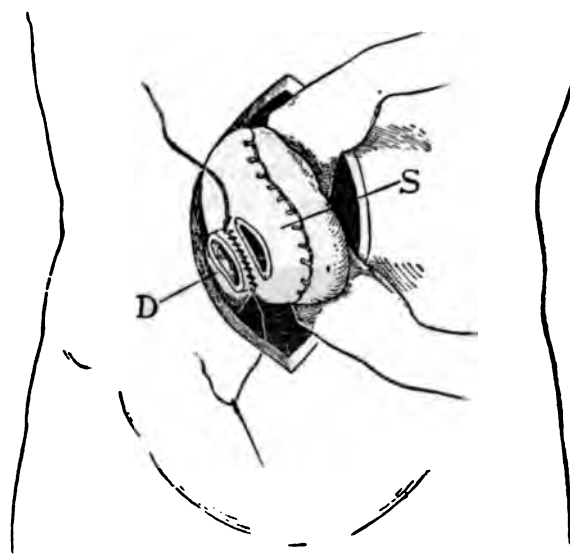
Fig. 121.—Pylorectomy. (*Kocher.*) Stump of the duodenum has been joined to the posterior wall of the stomach by a row of continuous Lembert sutures. Opening has been made in the stomach to receive the end of the duodenum. (*McGrath.*)

and the contiguous serous surfaces approximated over it and united with a row of Lembert sutures carried through the serous and muscular coats only; next, apply rubber-covered compression forceps to the duodenum several inches back from the end, remove the cotton plug from the end of the gut, cleanse thoroughly and join to the opening in the stomach by a continuous silk suture, including only the serous and muscular coats, leaving the ends long, that they may figure in the last stitches taken at either extremity of the wound after the union along the sides is completed. (See Cut.)

The protective pads are now removed and others substituted, while the parts involved in the anastomosis are inspected and cleared of blood and other fluids; they are then removed and the organs returned to their normal position, when the external wound should be closed with silk-wormgut sutures. That the operative work may be executed in the shortest possible time and the period of anæsthesia may be limited, every detail should be previously arranged to expedite the successive steps in the operation. Especially should the needles be threaded with fine iron-dyed or Chinese silk; usually a dozen or more should be ready for any emergency that might occur during the operation.

Alimentation should be practiced only by the rectum for the first two or three days, relying largely on peptonized milk, egg albumen in water, and beef tea if it does not cause rectal irri-

Fig. 122.—A cylindrical anastomosis button.

tation. Feeding by the stomach should be commenced with egg albumen in water in limited potions. Anastomosis of a divided intestine is accomplished in two ways, viz, by the use of the Murphy button, and end-to-end approximation; the margins of the intestine being secured by the Lembert or Halstead form of suture. The former method is the most quickly executed, the technic of which is as follows: after the preliminary work has

been done, such as rendering the field of operation aseptic, anæsthetizing the patient, the abdomen should be opened in the median line to the required extent; the diseased portion of

Fig. 123.—Oval form of anastomosis button.

the intestine is next secured, the contents stripped back from the point of division of the bowel, and intestinal clamps applied a few inches back on either side of the affected area. After separating the diseased loop of the intestine from the contiguous
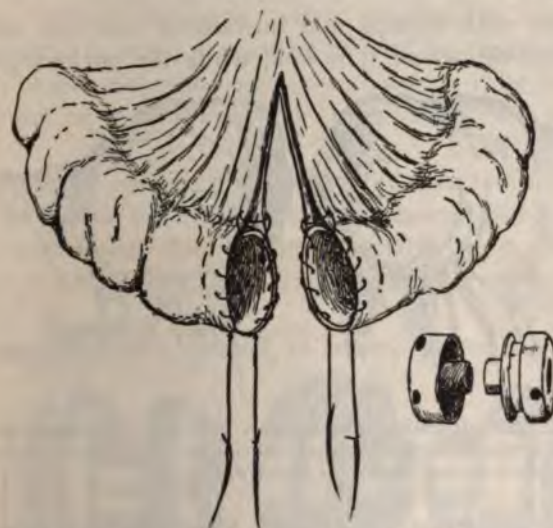
Fig. 124.—Intestinal anastomosis with the Murphy button. The margins of the divided bowel are whipped over with a purse-string suture; a loop is taken through the layers of the mesentery, close to the wall of the gut, in order to obliterate the dead space. (*McGrath.*)

parts with hot sterile pads, the division of the bowel is made and its lumen thoroughly cleansed. Now secure any bleeding points that appear in the mesentery and wipe dry the opposing ends of the gut with pledgets of gauze. Next, place a purse-string suture in the margin of each end of the bowel by an over-and-over form of stitch forming a loop around the vessels at the junction of the mesentery with the bowel to control any possible hemorrhage from this point; silk or catgut being used for the puckering string. The button is separated and the male half
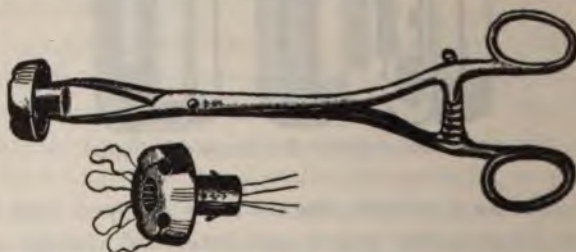
Fig. 125.—Forceps useful for the introduction of the Murphy button.

is picked up with forceps and introduced into one end of the divided intestine, where it is held while the puckering-string is

Fig. 126.—Intestinal anastomosis with the Murphy button. The button is separated, each portion being held in position by a purse-string suture. (*Richardson.*)

drawn snugly and tied. (See Cut). Next, place the other half of the button in the other end of the bowel and secure it in like manner. Thus the peritoneal coats are inverted and secured about the stems of the button which securely holds them when

Fig. 127.—End-to-end approximation, the two portions of
the button locked. (*Richardson.*)

the button is tightly pressed together Union takes place at the
peritoneal boundary between the opposing ends and later the
compressed parts of the bowel slough, allowing the button to
pass on from the primary point of union. After cleansing the
parts of the intestine involved in the operation and removing
the protective pads, the exposed intestines are replaced within
the peritoneal cavity and the abdominal wound closed in the
usual way without drainage. After dusting the closed wound
with antiseptic powder, gauze pads should be placed over it, and
over all a bandage should be snugly adjusted. The first redress-
ing need not be done for a week unless symptoms of infection
arise.

If for valid reasons the end-to-end anastomosis with the
Murphy button be not feasible, the implement may be used in a
lateral anastomosis, thus uniting available portions of bowel
necessary to bring relief from existing morbid states endanger-
ing life.

In executing this method, as large a button should be used
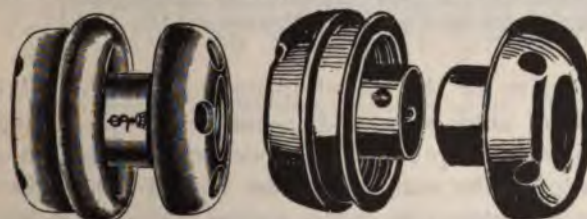
Fig. 128.—Extra large anastomosis buttons, Murphy's pat-
tern.

as is consistent with the size of the bowel to be united. With the preliminary work completed, that part of the intestine should be brought out of the abdominal wound and surrounded with hot sterile pads, the morbid portion cut away with scissors after the contents of the bowel are stripped back from the point of division sufficiently far not to complicate further proceedings, where it is retained by the application of compression forceps. All bleeding points in the mesentery are next picked up with artery forceps and compressed, twisted, or ligated, as the surgeon deems best; this done and the lumen of both ends of the gut thoroughly cleansed, a purse-string suture is taken on the side of the bowel some four inches from the end, enclosing five-eighths of an inch or so of space, and midway between these lines an incision into the gut should be made, sufficiently large to admit of the stem of the button, which is now introduced
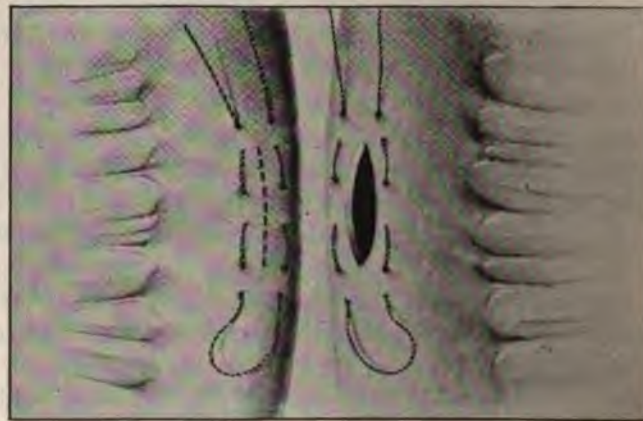
Fig. 129.—Lateral anastomosis with Murphy button. A purse-string has been introduced in both segments. One segment has been incised. (*McGrath.*)

into the lumen of the bowel through the end, and carefully pushed along until opposite the small incision, through which the stem is made to protrude; the puckering-string is now drawn tight, bringing the margins of the incised wound in the gut snugly around the stem of the button. The other half of the button is next introduced through an incision made on the op-

posite side of the other extremity of the bowel with similar provisions as were supplied the first. After tying the purse-string, the margins of the cut end of the intestines are inverted, bringing the serous surfaces together, securing them with fine silk sutures placed with a medium-sized millinery needle in an over-and-over form of stitch, including all the coats of the bowel; this row of sutures is further inverted and a second row of Lembert sutures placed, including the serous and muscular coats only.

The two halves of the button are now joined and firmly pressed together, and after cleansing the parts involved and replacing them the external wound should be closed.

In approximating divided small intestine, an end-to-end anastomosis is to be preferred to the union of one end to the side of the bowel or lateral anastomosis when the Murphy button is utilized to form the union.

End-to-end anastomosis of equal segments of intestine over a tube of absorbable material, by the Lembert or Halstead suture, is usually successful when the operation is properly performed, other conditions being favorable. The author has performed the operation several times, using a veterinary gelatine capsule of suitable size as the medium over which the ends of the divided bowel are approximated and carefully secured by

Fig. 130.—*Halsted's* method of resection of the intestine. The illustration shows his mattress suture placed.

the Lembert or Halstead suture. If the work is quickly executed, the capsule will remain intact and will preserve its form until the sutures are all placed, although it will soon be dissolved
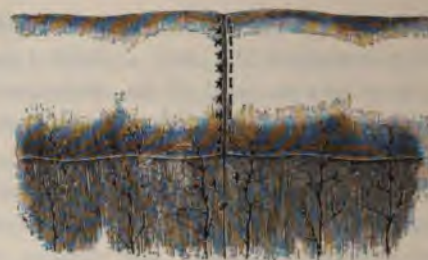
Fig. 131.—This illustration shows the sutures firmly tied.

by the action of the intestinal juices. The preliminary work up to the insertion of the capsule is, in all respects, similar to that done when the Murphy button is utilized to make the anastomosis.

In this method of anastomosis it is necessary to place two rows of sutures, the first including all the coats of the bowel and extending around the approximated edges as far as it is possible to go. The closed edge is then invaginated and another row placed, including the serous and muscular coats only, using fine iron-dyed silk for suture material in a small curved needle. At the conclusion of this part of the work, the wound is carefully inspected for any possible defect in the operative work, the parts thoroughly cleansed and replaced within the abdomen, the sterile pads all removed, but before closing the abdominal wound that portion of the intestine surrounding the gelatine capsule should be compressed, collapsing the flexible tube, thus allowing a circulation of intestinal fluids to take place while the capsule is undergoing disintegration.

Without the aid of a tube in uniting the ends of a divided bowel by the Halstead or Lembert suture method, it is a much more difficult task to perform.

Abbe's method of lateral anastomosis, by silk suture, to relieve morbid conditions of the bowel, is followed by excellent results when properly executed, as is Halsted's method; the two differing merely in the form of placing the retaining sutures. The former inverts the ends of the intestines after excision of the diseased portion has been performed, and secures them by a double row of sutures of iron-dyed silk by the Lem-

bert form of stitch. Next placing the two extremities side by
side, lapping by each other about four inches or more, uniting
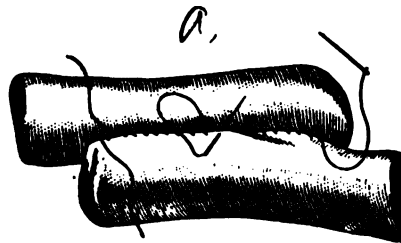
Fig. 132.—The placing of the first row of sutures before in-
cising the bowel in a lateral anastomosis.

the opposing surfaces by two parallel rows of continuous su-
tures about three inches as shown in the accompanying cut.
These sutures are placed with medium-sized cambric or mil-
linery needles about one-fourth of an inch apart, leaving them
long at each extremity of the line of sutures. With a sharp
bistoury make a three to four inch longitudinal incision in each
of the opposing sides of the extremities, about a quarter of an
inch from the first line of sutures; whip-stitch the margins of
the wound with a curved needle threaded with fine iron-dyed
silk, which unites the margins of the extremities on one side.
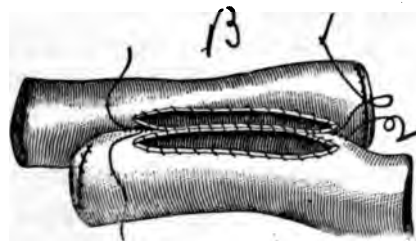
Fig. 133.—Whipping over the margins of the incision with
fine catgut.

With the parts involved in the operation cleansed of all fluids
the opening in each extremity is approximated and retained
while the second row of sutures are introduced and secured as
shown in Fig. B. The end of each suture is tied to the long
ends left at each extremity after placing the first row of sutures.

The primary row of sutures should extend a considerable dis-

tance beyond the opening in the opposing ends of the bowel, to provide for retraction of tissue after the incision is made

The Halsted method of lateral anastomosis by the mattress suture, requiring but one row, can be more quickly executed than the Abbe method, which requires a double row of sutures, hence it is in great favor with surgeons when executing the work without some form of mechanical device. After the preliminary work is completed, the ends of the bowel are inverted and closed with several mattress sutures. Next, place the opposing sections of the bowel to be united side-by-side lapping by each other to the extent of four or five inches, where they are joined by eight mattress sutures of colored silk introduced with a cambric needle just above the attachment of the mesentery, and securely tied. At each extremity of this line of sutures, two additional silk sutures are introduced, slightly radiating upward from the primary line of sutures. These, when tied firmly, unite the serous surfaces of the bowel at each extremity of the incised opening in the portions of the intestine to be united. The second or anterior row of sutures is next placed, about ten in number, but, before tying, the center ones are pulled to one side with hooks and a three-inch incision is made in the opposing sides of the intestine; the edges of which may be whip-stitched to prevent any possible hemorrhage taking place from these surfaces.

The retaining sutures are now tied, commencing with the middle ones and working toward the extremities; care being taken to draw each suture snugly, but not so tight that the tissues are likely to be cut through.

To expedite the operative work, everything that is likely to be needed should be at hand, especially should the needles be threaded with fine colored silk for sutures; and such remedies be provided as are likely to be needed in an emergency. With the anastomosis completed and the pads removed, the external wound is closed with silk-wormgut without drainage.

VOLVULUS

Volvulus is a morbid condition of the bowel due to a twist of the gut to such a degree that complete obstruction follows. Consequent upon this abnormal condition the mesenteric vessels become strangulated, increasing the already existing danger to the morbid state of the intestine. This condition seldom occurs in early life, but is noted in individuals of middle age of lax habits of body and where the mesenteric folds are exceptionally lax and flabby. The lower portion of the descending colon is a common location for the painful condition to occur, owing to the greater freedom of the bowel at this point.

In cases where the twist is complete, symptoms of obstruction are pronounced, such as nausea, vomiting, distress and pain from distention of the bowel above the twist with flatus and fecal matter, constipation with distressing tenesmus in most cases. Respiration is generally hurried, the pulse weak and rapid and the skin surface becomes bathed in cold perspiration and the patient's strength rapidly fails, if relief is not soon obtained. A fatal termination is preceded by hiccough and marked collapse.

Treatment. In efforts at relief of the morbid state, high injections of quite warm water to the extent that the bowel below the twist be fully distended may be tried, as may distending the lower bowel with gas. Not much time should be wasted, however, in repeated attempts along this line of procedure at the expense of the rapidly waning strength of the patient. With the nature of the case fully determined, more promise can be attached to opening the abdomen, seeking the part of the bowel involved in the morbid state and by careful manipulation untwist it. The abdominal incision may be made over the part involved if this can be accurately determined; in case this can not be ascertained it will be better to make the incision in the median line. It will be well to remember when seeking the location of the obstruction that that portion of the gut below the constriction is generally collapsed, while the portion above it is distended with flatus.

With the obstruction relieved, the abdominal wound should be closed at once with silk-wormgut sutures, each one of which

should include the entire structure of the abdominal wall. This accomplished, the wound should be dusted with antiseptic powder and a bandage adjusted.

If called to a case too weak to withstand a complete operation, the distention may be relieved and the patient given a new lease of life by stitching a knuckle of the distended intestine in the abdominal incision and incising it to the extent of an inch or more. At a later date, after the patient's strength has been recruited, the abdomen may again be opened and the twisted bowel righted when the artificial anus should be closed in the usual manner and the patient kept at rest in bed three weeks or more as the post-operative conditions of the patient may require.

The operative work should be done under the usual antiseptic precautions and the strength of the patient maintained with peptics and tonics, together with good nourishing foods.

HERNIA

A hernia signifies the protrusion of a soft part, like a loop of intestine, through an abnormal opening. The common forms of hernia are the umbilical, femoral, and inguinal; although several other varieties take place, their description will not be given here.

A hernia containing a knuckle of intestine, is called enterocele; when containing portions of omentum, an epiplocele; and when both intestine and omentum are contained in the abnormal cavity it is termed entero-epiplocele.

Hernia is said to be reducible when its contents can be returned to its natural cavity; and irreducible, when from any cause the protruding part can not be reduced by manipulating methods. The latter may result from slight gaseous, or fecal distention of the protruding loop, and from adhesions, or obstruction of the canal by tumors and prolapse of a portion of omentum.

A hernia becomes strangulated when the constricting medium obstructs the circulation; likewise the return of the protruding intestine or its contents.

The symptoms indicating strangulation are restlessness, frequent efforts to force a passage from the bowels, oppression about the abdomen, the pulse is rapid and weak, and there is belching of gas without relief. There may be pain near the site of the hernia, although this is not a distinguishing feature.

Fig. 134.—Inguinal hernia. The knuckle of intestine extending into the scrotum. (*Howe.*)

In all cases there is more or less nausea, retching and vomiting. The surface of the body is covered with cold perspiration, and if relief is not given within a few hours the patient gradually goes into a state of collapse.

The pre-disposing and the exciting causes of hernia are a flabby, weak abdominal wall, congenital defects, severe straining at stool, lifting, jumping, sneezing, and from other like exposing forces.

The diagnostic features of hernia, are bulging or fullness at the point of defect, on standing, coughing or straining, which subsides when the patient lies down; determining the presence of the hernial ring in invaginating the overlying, relaxed structures with the finger, and by percussion, if a hernia exists, a typmanic sound is elicited; should the fullness result from the presence of a tumor, omentum, or a collection of fluid, a

dull sound will be given off. A hernia must also be differentiated from hydrocele, bearing in mind that there is something of a resemblance in the two affections. The history of the case will aid in determining which of the two exists, remembering that in hydrocele the scrotum begins to fill up from
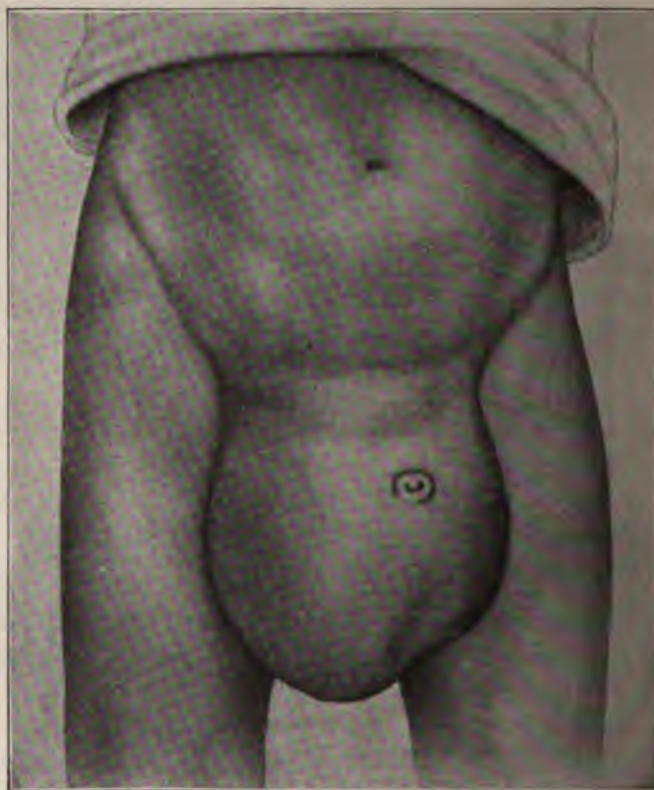
Fig. 135.—Large double oblique inguinal hernia.

the bottom, while in hernia the first evidence of the tumefaction is noted at the top.

In early life when the testicle descends into the scrotum, it pushes ahead of it a portion of the peritoneum, leaving a pouch-like process behind, in which is suspended the spermatic cord, not unlike the candle wick in the mo.. .. .. testicle resting at the bottom. Should a loop of

cend along this open canal into the scrotum, the condition is one of true congenital hernia.

Fig. 136.—Congenital inguinal hernia on the right side. (*Farnum.*)

Treatment: The palliative treatment of hernia consists in properly fitting some form of truss which will firmly retain the hernial mass within the abdomen after it has been replaced. There are several patterns of trusses to be had in the market that serve well their purpose, once the proper measurements are obtained and the truss properly adjusted. This form of treatment will bring about a cure in the majority of cases of hernia in young children under three years of age. The truss should be constantly worn during the day, but can be removed at night on retiring. After wearing a truss for a reasonable time, and the canal is not obliterated, operative measures should be resorted to   thods of procedure are in vogue, each having   ure of each case

will determine, however, what course to pursue. The one object of all the different methods is the obliteration of the canal, and the permanent closure of the internal ring. The simplest method for uncomplicated hernia is to proceed as fol-

Fig. 137.—This cut illustrates Bassini's method of operation for inguinal hernia. The skin and subcutaneous fat are divided, also the aponeurosis of the external oblique muscle, the aponeurosis of the external oblique muscle, the margins of which are turned out, showing the spermatic cord lifted out of the wound, and the deeper structures beneath. (*Farnum.*)

lows: Make an incision two inches or more in length over the tumor, extending through the skin, and the several layers of fascia, to the peritoneal sac, which is separated from the cord in inguinal hernia, opened, the loop of intestine returned to the abdomen, if it has not previously done so; a ligature

of strong cat-gut is thrown around the pouch of peritoneum as
high as possible, and the redundant portion cut away; elevate
the cord by a silk thong passed beneath it, while the edges of
the internal oblique and transversalis muscles are stitched to
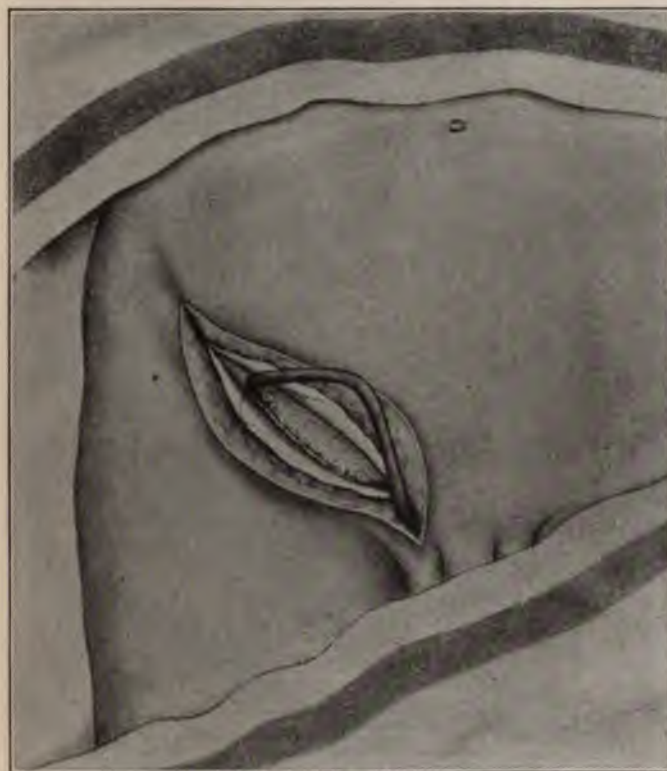
Fig. 138.—This illustration shows the conjoined tendon su-
tured to the edge of Poupart's ligament with cromicized cat-
gut.   (Farnum.)

Poupart's ligament by four or five sutures of kangaroo, or
chromicized catgut ligatures. Replace the cord upon the
newly made bed and unite the borders of the previously sev-
ered flaps of fascia over it, with continuous catgut sutures.
Close the incision in the integument in like manner and dress
antiseptically without drainage. The patient should remain in
bed for three weeks, after which he may be allowed to sit up

if all has gone well. It sometimes occurs that the peritoneal pouch is not readily found after cutting down upon the cord, it having slipped back into the abdomen; it will be necessary in such cases to let the patient come out from under the in-

Fig. 139.—Showing the margins of the aponeurosis of the external oblique joined, with catgut over the cord. (*Farnum.*)

fluence of the anæsthetic, and instruct him to cough, or bear down that the sac may be forced again into sight. It is never safe to ligate the sac without first opening it and liberating the knuckle of intestine if from any cause it still remains in the pouch; this is done with the finger introduced into the sac where it may remain while an assistant applies the ligature, slipping it off over the end of the finger when tying.

About the same general directions apply in the radical cure

of femoral hernia, as that given in the inguinal form, except there is no structure like the spermatic cord to deal with. After the structures overlying the sac have been severed, the sac is drawn forcibly downward, opened for inspection, and if found

Fig. 140.—Closing the external incision in the skin and fascia over the cord which can be done with an interrupted or a continuous suture. (*Farnum.*)

free from intestine or omentum it is tied in halves with a silk ligature and severed, allowing the stump to slip back into the abdominal cavity. The borders of the femoral ring are stitched together by passing five or six interrupted silk sutures, or by the purse string method, adopted by many of our modern surgeons. The cutaneous incision is treated in the usual way, with no provision for drainage.

Umbilical hernia is the result of arrest of development of the median abdominal walls, traumatism, and severe straining, as in child-birth. The immediate coverings are skin and superficial fascia, which in many instances are very thin.

Fig. 141.—Oblique inguinal hernia. (*Farnum.*)

The treatment in infants consists in approximating the recti muscles, and strapping with oxide of zinc adhesive plaster, over which apply a proper binder. Adults will require a specially made truss, the pad of which is of good size, and usually a little concave on the inner surface. For a radical cure, an incision should be made on each side of the tumor, usually at its base, commencing a little above and extending an inch

or two below the protruding mass, the overlying redundant
tissue is dissected out. The peritoneum is then sutured with
catgut, and the sheaths of the recti muscles are freshened
throughout the extent of the wound, and the muscular struc-

Fig. 142.—Double femoral hernia. Usually large on the
right side. (*Farnum.*)

tures united by silk, or chromicized catgut interrupted sutures.
The skin and fascia are then united in the usual way, the
wounded site dusted with borate of soda, and a bandage ap-
plied.

The treatment of strangulated hernia first demands efforts
by taxis, or by manual manipulation; to be successful, the
patient must be fully relaxed under the anæsthetic effect of
chloroform; the neck of the tumor should be grasped with the

fingers of one hand, while with the other extension and pres-
sure should be alternatingly made; always applying the force
in the line of the track of the hernial canal. Great force must
not be exercised during the manipulating process, as severe in-
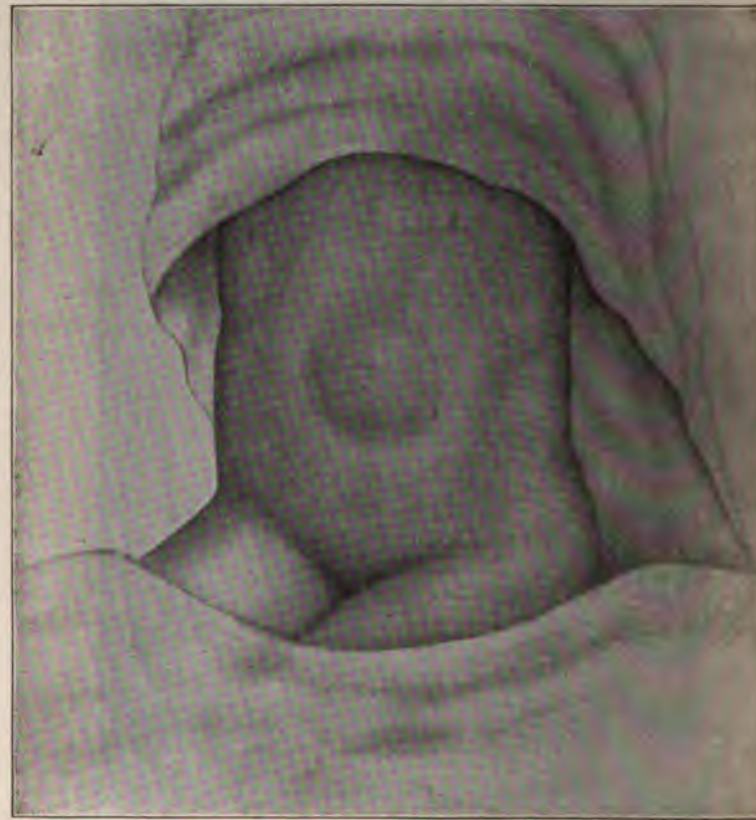
Fig. 143.—Umbilical Hernia.

jury to the intestine might ensue, especially if the morbid con-
dition has existed for any length of time under such circumstances
the coats of the intestine become friable and are easily rupt-
ured. If the manipulative effort proves effective, the incarcer-
ated loop of intestine will return to the abdominal cavity with
a gurgling sound. If the effort by taxis proves ineffectual
resort should be had at once to operative measures. An inci-

sion should be made over the protruding mass, extending through the skin and superficial fascia, by blunt dissection, expose the edge of the constricting medium; if possible tear this structure with the finger introduced through the opening; if this cannot be readily accomplished snip the edge of the glistening tendon with scissors or bistoury, aided by a grooved director, when the finger can easily complete the process. The edges of the divided structures are united by chromicized catgut sutures, and the wound dusted with antiseptic powder and bandaged.

Should a hernial pouch contain a portion of omentum that cannot be readily returned into the abdominal cavity, adhesions should be broken up if any exist, the mass ligated in sections and cut away, and the stump reduced. Adhesions may be so well organized as to require the application of two ligatures before it is severed.

Usually no food should be allowed for twenty-four to thirty-six hours following operative procedures, except it be sips of bovinine or beef tea in cold water, with cold table tea,
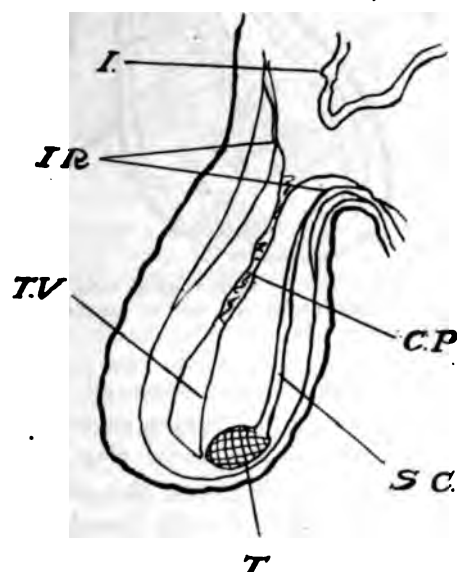
Fig. 144.—The scrotum and its contents in the normal state. *I*, intestine; *IR*, internal abdominal ring; *TV*,expanded extremity of the tunica vaginalis; *CP*, closed process of the tunica vaginalis; *SC*. spermatic cord; *T*, testicle.

or cold water to quench thirst. Pain, if severe, will call for
an occasional hypodermic injection of heroin, one-twelfth of a
grain injected near the seat of injury being usually sufficient.
It is advisable for the patient to wear a truss with a moderately
soft pad, for two or three months after he is up and around.

Congenital hernia differs from the acquired form in the re-
lationship of the structures involved, as will be noted by refer-
ring to the accompanying cuts. In Fig. 144, a normal condition
of the testicle within the scrotum, and its relative position to
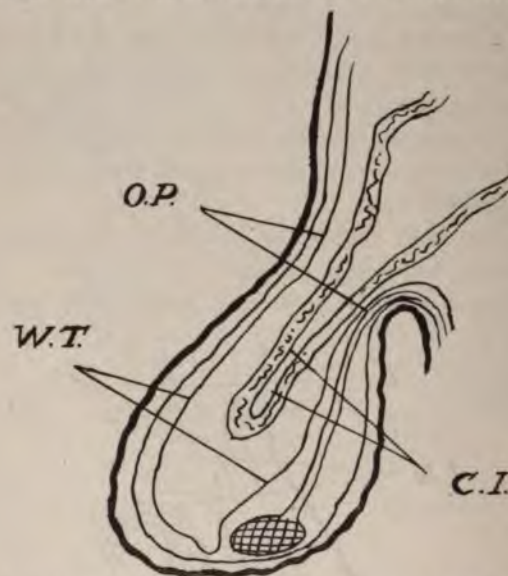
Fig. 145.—*IR*,pervious or open vaginal canal, with a coil of
intestine descending into it; *CI,* coil of intestine; *WT*, walls
of the tunic.

the overlying structures will be observed. It will be noted
that the vaginal process of the tunica vaginalis is entirely ob-
literated from the internal abdominal ring for some distance
along the membranous sheath, giving the gut but slight oppor-
tunity to force its way down through the closed process. Next
referring to Fig. 145, it will be seen that the pouch of peritoneum
remains pervious its entire length with a knuckle of in· ‘‘··
descending along the membranous canal, illustratin
nostic feature of a congenital hernia.

By reference to Fig. 146, a marked feature of an acquired hernia is seen in a coil of intestine descending into the scrotum through the inguinal canal, pushing a pouch of peritoneum before it, and external to the closed process of the tunica vaginalis testis. The difference in the formation of the peritoneal pouches through which the coils of intestine descend, and the relation of these pouches to the spermatic cord presents the

Fig. 146.—*OP*,open vaginal process, through which the coil of intestine is descending in acquired hernia; *NPP*,new peritoneal pouch; *CP*, closed vaginal process; *SC*, spermatic cord.

marked differential diagnosis between the acquired and congenital forms of hernia. In operations for the cure of congenital hernia, the vaginal process, or peritoneal pouch containing the knuckle of intestine must be dissected free from the spermatic cord before it can be tied, the redundant part cut away, and the stump returned within the abdomen, a procedure which will not be found an easy task in many cases; the cord being small and at times hard to locate.

VENTRAL HERNIA

A protrusion of some part of the abdominal viscera through a rent or separation of the overlying muscular structures, and resting against the skin and fascia at the site of a previous operation, is known as a ventral hernia. This form of hernia is most frequently observed in the median line following laparotomies, and in the right inguinal region from imperfect union of the muscular structures after doing an appendectomy, especially when suppuration occurs along the line of incision.

When the stomach is involved in the hernial protrusion a gastrocele is said to exist. A cystocele is the protrusion of the bladder; and it is not uncommon for the ovaries, gall-bladder and portions of the intestines to be found in the existing hernial sac.

Treatment. The treatment may consist of the application of a pad and bandage for temporary relief or a resort to operative measures for a radical cure. The latter is executed by dissecting out the bulging skin and fascia and freshening the margins of the muscular tissue, bringing them in contact and fixing them with a silk-wormgut suture, which passes through the structures en masse; or the peritoneum may be united with a continuous catgut suture and the remainder of the wound united with interrupted silk-wormgut. The wound is then wiped dry and dusted with antiseptic powder and dressed with gauze pads, which are held in place with adhesive strips and over all a bandage applied.

This method of procedure will apply to nearly all varieties of ventral hernia and is generally attended with success if the cicatricial tissue is entirely removed and the margins of the wound, especially the peritoneum, are properly joined with retaining sutures.

Following the operation, a pad and bandage should be worn for several weeks or months if the condition of the case demands it.

By reference to Fig. 146, a marked feature of an acquired hernia is seen in a coil of intestine descending into the scrotum through the inguinal canal, pushing a pouch of peritoneum before it, and external to the closed process of the tunica vaginalis testis. The difference in the formation of the peritoneal pouches through which the coils of intestine descend, and the relation of these pouches to the spermatic cord presents the

Fig. 146.—*OP*,open vaginal process, through which the coil of intestine is descending in acquired hernia; *NPP*,new peritoneal pouch; *CP*, closed vaginal process; *SC*, spermatic cord.

marked differential diagnosis between the acquired and congenital forms of hernia. In operations for the cure of congenital hernia, the vaginal process, or peritoneal pouch containing the knuckle of intestine must be dissected free from the spermatic cord before it can be tied, the redundant part cut away, and the stump returned within the abdomen, a procedure which will not be found an easy task in many cases; the cord being small and at times hard to locate.

VENTRAL HERNIA

A protrusion of some part of the abdominal viscera through a rent or separation of the overlying muscular structures, and resting against the skin and fascia at the site of a previous operation, is known as a ventral hernia. This form of hernia is most frequently observed in the median line following laparotomies, and in the right inguinal region from imperfect union of the muscular structures after doing an appendectomy, especially when suppuration occurs along the line of incision.

When the stomach is involved in the hernial protrusion a gastrocele is said to exist. A cystocele is the protrusion of the bladder; and it is not uncommon for the ovaries, gall-bladder and portions of the intestines to be found in the existing hernial sac.

Treatment. The treatment may consist of the application of a pad and bandage for temporary relief or a resort to operative measures for a radical cure. The latter is executed by dissecting out the bulging skin and fascia and freshening the margins of the muscular tissue, bringing them in contact and fixing them with a silk-wormgut suture, which passes through the structures en masse; or the peritoneum may be united with a continuous catgut suture and the remainder of the wound united with interrupted silk-wormgut. The wound is then wiped dry and dusted with antiseptic powder and dressed with gauze pads, which are held in place with adhesive strips and over all a bandage applied.

This method of procedure will apply to nearly all varieties of ventral hernia and is generally attended with success if the cicatricial tissue is entirely removed and the margins of the wound, especially the peritoneum, are properly joined with retaining sutures.

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TUBERCULOSIS OF THE BOWELS.

Tuberculosis of the intestines seldom takes place as a primary affection. The attack is generally secondary to the appearance of the disease in the lungs or other organs of the body.

The disease usually manifests itself in the mesenteric glands, and the ileocæcal region is a common point of attack. Soon after the onset of the disease, the mesentery and walls of the intestine become infiltrated with serum, often to the extent that a considerable pain and distress are experienced by the patient, and the lumen of the bowel is encroached upon by the swelling of the surrounding structures.

When the disease attacks the ileocæcal tissues, the parts involved enlarge to a degree that the tumefaction can be easily felt through the walls of the abdomen, but should be differentiated from morbid growths and a thickening of the walls of the cæcum caused by frequent attacks of appendicitis.

The symptoms usually accompanying tuberculosis of the bowels are abdominal distress, pain more or less severe in character, digestive disturbances sometimes resulting in diarrhœa, tenderness on pressure, distress after eating, distension of the abdomen, and gradual loss of flesh.

The disease is not of frequent occurrence in childhood, it appearing more frequently in middle life and in individuals of a strumous habit of body.

Treatment. Medication can accomplish but little in the treatment of this affection, except to increase the appetite and assist digestion and the assimilation of food to the end of better blood making.

If the diseased area can be determined by palpation and there is evidence of stenosis it is considered good surgery to make an attempt to remove the diseased area if it is not too extensive. The operation, when feasible, should be preceded by intestinal anastomosis, excluding the diseased portion, which is later excised.

The operation should not be done when the patient is sorely depressed with a deposit of tubercle in other vital organs, which later will endanger his life.

TUMORS OF THE LIVER

The structure of the liver is of such a nature that it is often the primary seat of both benign and malignant growths; of the former variety adenomata and angiomata are the most commonly met with. Sarcomata and cancerous growths form the latter variety and are very likely to appear as a secondary manifestation of the morbid disease, it having appeared primarily at some other portion of the body.

Adenomata do not develop to a very large size; they usually appear near the surface of the organ as greenish-white bodies surrounded by tissue of a tough fibrous nature. Malignant growths develop as hard grayish-white bodies, or the entire organ may become so thoroughly infected that it takes on a morbid enlargement caused by infiltration of its stroma.

The development of simple growths in the liver are nearly always devoid of symptoms during the early stages of the disease. Not until the tumors grow to the size of an egg, or larger, can they be palpated through the walls of the abdomen.

Malignant growths will cause a gradual enlargement of the liver, with the usual train of symptoms observed in diseases of this nature, when located in other portions of the body; and in connection, there is likely to be a marked jaundiced condition of the system, which is especially in evidence after the disease is well advanced. Anemia and a gradual loss of flesh will then be marked features of the ailment as will ascites and edema of the feet and legs.

Treatment. Little if anything can be accomplished by medicinal measures in the treatment of tumors of the liver, other than to stimulate and tone up the system, that the strength may be maintained, especially if a resort is had to surgical measures.

A considerable portion of the liver substance containing a growth of either variety may be resected with every promise of relief, when the tumor is located near the anterior surface or margins of the organ. The technic of resection of portions of the liver is briefly given as follows: after the patient has been prepared for the operative work in the usual manner, the liver should be exposed through a vertical or oblique incision of sufficient length to make the succeeding work easy of ex-

ecution. The vertical incision is made in the median line, extending downward from a point about two inches below the tip of the ensiform cartilage. The oblique incision should extend from the median line obliquely downward and outward just below the margins of the ribs.

To remove the growth, a wedge-shaped area including the tumor, should be excised when feasible, but before this is done, it will be well to compress the substance of the gland on either side of the proposed incisions with compression forceps or clamps, the blades of which are covered with sections of small rubber tubing; this is done to prevent unnecessary loss of blood. A scalpel is usually employed to remove the growth, but sharp-cutting scissors will do as well. Following the removal of the growth, the active bleeding points should be picked up with thumb forceps and ligated with fine catgut or twisted. The compression forceps should then be loosened a little to see if the rush of blood to the traumatic surface will expose overlooked divided vessels. The margins of the wound are next approximated and quite firmly held in apposition with deep mattress sutures of fifteen-day catgut and snugly tied, care being taken not to put too much tension on the strands to cause them to cut through the friable tissue. A blunt needle should be employed to pass the sutures. Following this procedure, the cavity of the abdomen in close proximity to the liver should be cleansed of blood and the gauze pads previously used for packing or walling back the intestines then removed and the external wound closed with silk-wormgut sutures with or without drainage, as the individual case will determine. The wound area should next be dusted with antiseptic powder and dressed with sterile gauze and bandaged.

ULCER OF THE STOMACH

Gastric ulcer may result from any one of several causes, viz: chronic catarrh, irritation of mucous membrane, tuberculous anemia, and traumatism. The ulcer is not large, usually round in shape and perforating in character. It is generally found in the posterior wall of the viscus, near the lesser curvature. The

edges of the sore are usually clean cut and somewhat indurated. The ulcer generally appears singly, although cases are observed where numerous ulcers are found extending over the mucous surface of the stomach.

The symptoms commonly noted in perforating ulcer of the stomach are localized distress, pain after meals, vomiting of ingesta sometimes mixed with blood, and marked anemia in the latter stages of the disease.

Through the lack of proper digestion of food the blood soon becomes deficient in life-sustaining qualities and the patient gradually grows weaker. The localized pain and the vomiting of mucus and ingesta streaked with blood are especially characteristic of the ulcerative state.

Peritonitis soon follows complete perforation of the wall of the stomach, terminating fatally unless relief is obtained by operative procedures. Death may also result from pronounced anemic conditions.

Treatment. Treatment in the early stages of gastric ulcer is by both hygienic and medicinal measures. Of the first importance is the giving to the stomach rest; this can be done by giving nourishment to the body by rectal feeding, which should be properly regulated as regards frequency of feeding, quantity required, and the character of the fluid food used.

The nutritive fluids best suited for rectal alimentation are peptonized milk, hot beef-tea and milk in equal portions, one or two eggs well beaten and added to eight ounces of milk to which a little salt has been added, well agitated and warmed to a degree a little above that of the body, and nutrient suppositories. This method of alimentation should be kept up for a month or more as the patient's condition will suggest, during which time, rest in bed or at least from active exercise should be enjoined. A return to normal feeding should be gradual; milk, soups or broths, and gruels being given quite warm and in small quantities.

Before each rectal feeding the lower bowel should be irrigated with warm salt water (℈ 1 to water O 1). Care should be taken not to give the nutritive fluids in quantities so great that the presence of the liquid will provoke its evacuation. Four to eight ounces is the usual amount given at one feeding. It

may be remarked in this connection that a little lime water added to milk will greatly aid in its kindly reception by the stomach when again returning to this method of taking food. Well cooked arrowroot may also be added with good results.

Remedial agents should be given only as indications call for them in the early stages of the attack; thus, nausea and vomiting, associated with a burning pain in the stomach, will be relieved by spc. tr. aconite and amygdalus in small and frequently repeated doses; especially are these remedies indicated when the tongue is clean but pointed with reddened tip and edges. Arsenicum in small doses also relieves the above symptoms, especially when they are associated with unnatural thirst and a feeling of weakness and distention in the stomach.

The belching of foul smelling gas and the vomiting of sanious matter with the odor of decaying flesh will call for guaiacol in minute doses, taken every two or three hours, as the individual case may require. Milk of magnesia will relieve sour eructations and waterbrash. Spc. tr. hydrastis in two or three drop doses will do as well. A few drops of the tincture of calendula taken in hot water often relieves the gastric soreness frequently complained of.

Hemorrhage is controlled with five-drop doses of hamamelis in a little water frequently repeated. Ipecac and ergot in small doses will do as well. Severe cases may require hypodermic injections of ergot (15 drops) and morphia ($\frac{1}{4}$ grain), or, instead of the ergot, use adrenalin chloride in suitable doses. Argentum nitrate in $\frac{1}{8}$ to $\frac{1}{4}$ grain doses, taken before meals, with a few swallows of water, not only relieves soreness and griping pain in the stomach, but it acts as a tonic to mucous surfaces.

Grave cases of vomiting, indigestion and hemorrhage that fail to yield to remedial treatment, will require surgical intervention for relief. In such cases, the ulcer is generally excised and the margins of the wound approximated and sutured with iron-dyed silk. The work is done through a median incision made over the stomach, extending from the ensiform process to near the umbilicus. For a day at least, all food should be withheld from the stomach, and, immediately preceding the operative work, the viscus should be thoroughly washed out.

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After finding the ulcer, the edges should be carefully inverted and closed in with two rows of sutures, the first a continuous one and the second should be of the Lembert variety The organ should then be carefully gone over for evidences of other perforations, which, if found, should be treated as was the first. At the conclusion of the operation, the peritoneal cavity should be thoroughly flushed with warm salt solution (3 ij to water qt. j) and the field of operation wiped dry with pledgets of sterile gauze. After removing protecting gauze pads or sponges the external wound is closed in the usual manner.

The ultimate results following operative measures for the cure of perforating ulcer of the stomach depends largely upon the surgeon's technic, the vitality of the patient, and the early diagnosis of the morbid condition.

CANCER OF THE STOMACH

Carcinoma of the stomach is of frequent occurrence. It is essentially a disease of adult life, and is observed more frequently in men than women. There are several varieties of the malignant disease that may attack the digestive organ, viz; scirrhous, colloid, soft or medullary, and epithelioma. Of this variety, the scirrhus or hard cancer is the most common form met with, and the pylorus the part of the organ the most frequently attacked.

The etiology is somewhat obscure, although chronic ulceration is thought to be the most common cause. Heredity is given as an important etiological factor and no doubt is responsible for the morbid disease in many cases.

The medullary form of cancer of the stomach is very apt to break down in ulceration, while the scirrhous variety converts the tissues into an indurated mass, causing a constriction of the part, eventuating in stenosis of the pyloric orifice with dilation.

The malignant disease of the stomach is generally primary in character, although it may be secondary to an attack in some other part of the body.

There are no well-marked symptoms in the early stages of the disease, outside of mild attacks of irritation following a

hearty meal, simulating indigestion; at a later period, the patient complains of a constant burning pain in the pit of the stomach, attended with nausea and oftentimes vomiting, with marked tenderness on pressure. Dyspeptic symptoms are a marked feature of the ailment now and the bowels are constipated. As the disease progresses the patient becomes emaciated, there is an appearance of cachexia about the features and a condition of anemia supervenes.

The retention of food is difficult and the material vomited has the appearance of coffee-grounds.

If the patient is much emaciated the cancerous growth can be outlined through the walls of the abdomen.

Inflating the stomach through the stomach-tube after evacuating all of its contents, will give a proper estimate of the degree of dilation, which is ascertained by percussion; the area of tympanites covering approximately the space occupied by the distended stomach, which may extend as low as the umbilicus.

Unless perforation takes place between the stomach and transverse colon or duodenum, allowing a new avenue for the escape of the contents of the stomach, the malignant disease generally proves fatal in from one to two years. Should the perforation in the stomach allow the stomach contents to escape into the peritoneal cavity death will soon follow from suppurative peritonitis.

Treatment. Little relief will be given by remedial measures in the treatment of carcinoma of the stomach; however, at the outset, the irritation and digestive disturbances may be relieved by salol, bismuth, and milk of magnesia and a change of diet if necessary; liquid food taken hot being the most readily digested. If the stomach rejects food taken in this form, resort to rectal feeding will next be in order.

Severe paroxysms of pain are to be subdued with heroin, codeine, or morphine hypodermically administered and a constipated state of the bowels is to be relieved with enemas of glycerine and water.

If the removal of the pylorus (pylorectomy) is resorted to, it should be done in the early stages of the disease; it is executed as follows; after the patient has been prepared for the operative procedure, chloroform or ether should be administered to com-

plete narcosis. A linear incision four or five inches in length is made over the most prominent part of the tumor extending downward from a point near the ensiform process. The soft structures are divided down to the peritoneum, which is picked up and incised between mouse-tooth forceps. The stomach, which has been previously washed out thoroughly with weak salt water, will be found lying empty just beneath the abdominal wound. The part of the organ containing the cancerous mass is then drawn into the abdominal wound and the omenta adjacent to the malignant mass tied in sections with double ligatures and severed with scissors. While executing this work great care should be taken not to injure other important vessels lying behind the pyloric end of the stomach, chief of which are the hepatic artery, portal vein, and the common bile duct.

If, upon examination, adhesions about the tumor mass extensively involve the adjacent structures, including the mesocolon, the complications will be too great to justify further procedures.

If the involvement of near-by structures is not extensive, sterile gauze pads or sponges should be packed around the morbid mass, which is then removed with scissors, care being taken to get outside of the unhealthy tissue; all bleeding vessels are picked up with forceps and secured at once with silk ligatures. As the gauze packings are likely to be considerably soiled by this time, they had better be replaced with fresh ones. To prevent soiling the wounded tissue with bowel contents, the lumen of the duodenum should be plugged with pledgets of sterile gauze or cotton as soon as divided. The opening in the stomach should next be narrowed down to the size of the duodenum by removing a V-shaped portion from the lesser curvature, closing the rent with Czerny-Lembert sutures. If, by the removal of the growth, so much of the stomach is sacrificed that it would be better to remove the V-shaped portion from the greater curvature, it can and should be done in the same manner as when taken from the lesser curvature. The divided ends of both the duodenum and stomach are then inverted and the serous margins approximated and secured by Lembert sutures, fifteen-day catgut suture material being preferred, although fine silk can be used with confidence. The sutures should be placed about an

eighth of an inch apart and snugly tied. The posterior margins of the divided ends are united from the inside, and as far in front as it is convenient to insert the sutures. Before placing the sutures in the anterior margins, the sponges previously inserted in the end of the duodenum should be removed. With the sutures all in place, the stomach may be partly filled with water through the stomach tube; if there be no leakage the protective sponges should be removed, the sutured ends once more carefully inspected and, if found in good condition, the abdominal wound is closed in the usual way.

On account of the great mortality attending pylorectomy (50 per cent) gastro-enterostomy is frequently executed instead. This operation is done to relieve the stomach of its contents and to give it rest. The preliminary preparation is the same as for the operation of pylorectomy.

The viscus is approached through a liberal median incision extending from the ensiform process downward about six inches, after entering the peritoneal cavity that portion of the intestinal tube is sought for that is intended to join to the stomach. This may be the duodenum, jejunum, or ileum; whichever one of these parts of the intestinal tract is selected to join to the stomach, care should be taken to so place the loop of intestine that after union has been established between the two organs the peristaltic wave of the intestinal tube will not be different or opposite to that of the stomach.

After the stomach and loop of intestine have been drawn well into the abdominal incision they should be well surrounded with gauze pads to catch any escaping fluids and to wall off and protect near-by abdominal organs. The stomach having been previously washed out, remains empty and the contents of the intestinal loop are stripped downward with the thumb and finger and prevented from returning by passing a rubber band through the mesentery and around the gut a suitable distance on each side of the proposed opening into the loop and securely tied.

The operation may now be completed by joining the loop of intestine to the anterior wall of the stomach with a Murphy button or by silk sutures. If the former method is adopted a suitably sized incision is made in both organs to allow each

part of the button to be inserted and the margins of the wound closed around the stem with a purse-string suture. The two parts of the button are then pressed tightly together, annexing the two organs in the quickest possible manner.
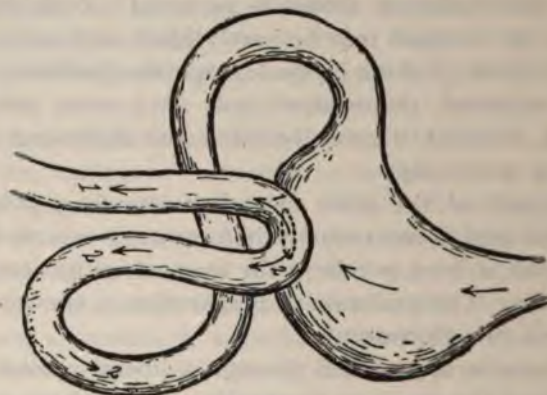
Fig. 147.—Gastro-intestinal anastomosis.

When the latter method is followed, the posterior portion of the intestine is joined to the anterior surface of the stomach

Fig. 148.—Anterior gastro-enterostomy. Union of a loop of intestine with the stomach. (*Bryant.*)

near the greater curvature by a continuous silk suture about four inches in length. The suture material should be fine iron-dyed silk, and when placed it should merely pass through the

peritoneal and muscular coats of both organs; openings in the stomach and intestine are next made opposite to and parallel with each other. After wiping away exuding contents of the organs a continuous suture is taken through the posterior margins of the incisions in both the stomach and the intestine, passing through all of the layers of the gut and is extended each way as far as possible around the angle of the incision. The anterior surfaces of the stomach and intestine are next securely united with a row of Lembert sutures, or, what is perhaps better, a continuous suture extending from one end of the first suture line to the other. The sutures are to include only the peritoneal and muscular coats of the organs, using a small round needle armed with fine iron-dyed silk, the stitches being placed at intervals of an eighth of an inch apart. After joining the two organs together, the rubber constricting bands are removed from the intestinal loop, the protective pads previously placed in the wound to wall off adjacent abdominal organs are then removed, the sutured area again carefully examined for any possible faulty work, and if found in good condition the abdominal incision is closed by joining each layer with fifteen day catgut or by approximating the margins of the incision and securing them with silk-wormgut sutures. A large sterile pad is next laid over the external wound and secured in place by an abdominal bandage.

CYSTS OF THE PANCREAS

Cysts forming in the pancreas are occasionally encountered in individuals of adult age. The morbid condition may result from an attack of acute inflammation and it may be caused from degeneration of some one or more of the branches of the pancreatic duct; whether or not these are the common causes of cystic growths, the fact remains that the history obtained from numerous patients suffering from this affection would lead us to believe that they are.

The contents of these cystic tumors may be serum, but it is more likely to consist of pancreatic fluid, at least a goodly percentage of it; or bloody serum, if the development occurs soon after the receipt of an injury to the organ.

As the growth of the cyst is, in the majority of cases, slow, its true character should be differentiated from tumors of the liver, stomach and the upper portion of the intestines. This can be done, in a measure, if a portion of the fluid contents are drawn off with an aspirating needle and mixed with fluid starch in equal quantities; if the starch is converted into sugar, it is very evident that the tumor is of the pancreas.

Pain is not a characteristic feature of the morbid state, except the growth develops to a large size, in such cases, pressure may provoke more or less distress. Certain articles of food do not digest well and digestive disturbances soon become manifest. In individuals who are thin in flesh, the growth, after it is well developed, can be quite well outlined through the abdominal wall as a globular, elastic tumor and percussion gives off a dull sound, and as the growth usually rests behind the transverse colon and stomach, these organs have to be reckoned with when attempting operative work upon cystic development of the pancreas.

Treatment: After the patient has been prepared for the operation and anæsthetized, a four-inch incision should be made in the median line, when feasible, or over the prominent part of the tumor, severing skin, fat and fascia, down to the peritoneum, which is not opened until all bleeding points have been secured by ligature. This membrane may not need opening more than an inch and a half to two inches, when the cyst, by manipulation, should be made to appear in the wound, where it is steadied while its contents are evacuated, either with an aspirating needle or through a small incision in the presenting part of the cyst-wall. The hemorrhagic cyst is not likely to refill once the fluid is withdrawn. The other varieties will, hence it will be necessary to secure the cyst-wall to the margins of the abdominal wound by a continuous catgut suture and permanent drainage established.

While the cyst is discharging, it will be necessary to cover the abdominal wound with a gauze pad to take up the continuously escaping fluid. In cases where the discharge is profuse, redressings will have to be done several times during the day. In time, some of these cases will get well, others continue discharging through a fistulous opening for years, the skin sur-

face around about the opening being continuously in a state of irritation, caused principally by the caustic action of the escaping fluid.

As the disease is somewhat debilitating, the general health will have to be maintained by administering peptics and tonics and feeding on rich, nutritious food.

CANCER OF THE PANCREAS

Cancer of the pancreas is occasionally met with, but it is not of frequent occurrence as a primary affection. On the contrary, it is secondary to the malignant disease in some one of the nearby organs, generally the pyloric end of the stomach. The morbid condition soon extends to the common bile duct, and, to a great extent, that important canal becomes occluded, resulting in a functional disturbance of the liver, causing a marked jaundiced state of the blood, accompanied in many cases, by an intense itching of the integument.

The patient often complains of nausea and in some cases, vomiting occurs soon after meals. Tenderness on pressure is a common symptom, but the colicky pain that is usually present in gall-stone obstruction of the duct, is not experienced in these cases, where the passage is involved in a cancerous mass extending from the pancreas. Besides the symptoms mentioned, there is a gradual loss of flesh and the patient complains of general weakness upon exertion. Later along in the disease, the liver becomes abnormally enlarged and a dropsical condition of the body becomes manifest.

Treatment: In the treatment of cancer of the pancreas, no benefit can be expected from the administration of medicinal agents, except such remedies as will temporarily stimulate both the appetite and strength. Operative measures can give only temporary relief, but the patient is usually in a too feeble condition to endure a heroic operation. The operation generally executed for the relief of pent up bile is that known as cholecystenterostomy, which has reference to the union of the fundus of the gall-bladder to the second portion of the duodenum, which is done with a small Murphy button, when this operation is feasible.

ACUTE PANCREATITIS

Acute inflammation of the pancreas may be due to traumatism, shock from intense cold, and obstruction of the bile duct near its termination by a gall stone, tumor, or malignant ulcer, and septic infection from pyogenic and other bacilli entering the gland through the pancreatic duct by way of the ductus choledochus. When the inflammatory action arises from the latter cause it not unfrequently terminates in suppuration, forming abscesses that will terminate fatally unless the purulent fluid is promptly evacuated. The diagnostic features of suppurative pancreatitis are rigors, hectic fever, tenderness in the region of the gland upon pressure, loss of appetite, unnatural thirst, and a jaundiced skin more or less intense in character, depending upon the degree of obstruction of the common bile duct.

The gland often undergoes degeneration, sometimes attended by hemorrhage when the blood vessels, with which the pancreas is richly supplied, are involved. The breaking down of the parenchyma of the glandular organ is largely due to the presence in its structure of pancreatic fluid, escaping from fluid passages of the gland.

Diagnostic features of hemorrhage resulting from the degeneration of the pancreatic blood vessels, if of a considerable amount, are restlessness, abdominal pain, rapid pulse, nausea and pale features, cold, clammy perspiration, collapse, followed in grave cases by death.

The morbid condition should be differentiated from diseased states of adjacent structures, such as malignant disease of the bile ducts, or obstruction of the same from any cause, gastric ulcer, and diseased states of the upper duodenal canal. Cases will present where the diagnostic features are so obscure that it will require an abdominal section to determine which of the organs is diseased.

Treatment. Medicinal treatment, except in the early stages of the disease, accomplishes but little good, and owing to the little physical disturbance caused by the disease at this time, the true nature of the affection is hardly suspected. The early conditions, such as fever, tenderness, slight pain and nausea, may

be relieved by small and repeated doses of the following prescription:

R.
 Spc. Tr. Aconite .... gtt. x
 Spc. Tr. Bryonia .... gtt. xv
 Peppermint Water ....fl. ℥ iv
M. Sig.—A teaspoonful every hour.

And may be alternated with advantage to the patient by the following mixture:

R.
 Spc. Tr. Aconite .... gtt. x
 Spc. Tr. Dioscorea .... gtt. xx
 Infusion of Amygdalus ....fl. ℥ vi
M. Sig.—Give in teaspoonful doses.

Externally, antiphlogistine or a wet pack may be applied with much benefit, as may libradol.

Surgical measures should be resorted to as soon as the patient shows evidence of septic infection.

As before remarked, rigors, hectic fever, restlessness and pain of a more severe character, rapid feeble pulse, thirst, and periods of cold perspiration, mark this stage of the disease.

To explore the glandular organ and open abscess cavities, if found to exist, and to establish drainage, the abdomen should be opened in the median line above the umbilicus, after the patient has been properly prepared for the work. On exposing the greater omentum it should be separated by blunt dissection, which will bring the pancreas at once into view. Collections of pus, when present, may be determined by palpation. These may be opened, cleansed with peroxide of hydrogen, or a dilute solution of the alkaline mixture, and a drainage medium placed in the wound. If the pus cavity be deep it should be packed with sterile gauze as soon as cleansed. Before closing the abdominal wound all bleeding points should be picked up and ligated, or otherwise secured.

If it is found upon opening the abdomen that the abscess has ruptured, permitting the purulent fluid to burrow downward into the pelvis, an opening should be made through the flank, allowing the pus to escape and permitting the placing of an appropriate drainage tube.

It is possible is some cases of deep-seated abscess formations

to establish efficient drainage posteriorly, by making an incision through the soft parts overlying the organ.

The after treatment consists in keeping the parts clean with antiseptic fluids, and supporting the patient's strength with peptics and tonics, and a liberal amount of rich and nutritious food.

CHRONIC PANCREATITIS

Chronic pancreatitis usually results from a long continued inflammation of the pancreatic duct, which is due to septic influences. As the disease commences in the head of the gland, the most marked changes in the parenchyma are noted in the enlarged portion of the organ. A diagnostic feature of this affection, is the general cirrhotic state of the tissues, without hypertrophy. Owing to the involvement of the pancreatic and the dependent portion of the bile ducts in the inflammatory degeneration, the morbid condition is thought to be responsible for some of the severe forms of jaundice.

Chronic pancreatitis not infrequently accompanies, or follows as a sequela, several of the more severe general diseases, such as general tuberculosis, syphilis, alcoholism and malignant disease of the liver and intestines.

The character of the symptoms depends largely upon the exciting cause of the disease. When due to constitutional affections, such as above mentioned, there may be but little distress and pain or tenderness on pressure. If due, however, to malignant disease of nearby organs, tenderness and pain from engorgement of blood vessels are frequently experienced in the epigastric region. Jaundice is a marked symptom of this form of the disease, due to obstruction of the pancreatic and bile ducts. There is present more or less gastric disturbance, often attended with diarrhœa, the discharges being light colored and frequently containing fibres of partly digested meat and globules of fat.

On account of the disturbance of the liver, and the jaundiced state of the secretions, the urine is highly colored and of greater specific gravity.

It has been observed by pathologists of note, that the jaundice resulting from chronic pancreatitis is of a lighter hue than

is that provoked by malignant disease, hence, this fact is taken into consideration in forming a diagnosis.

Treatment: ' The nature of the affection precludes any effort to relieve, much less cure it, with remedies. True, painful states, resulting from malignant disease, or the presence of some obstruction in the bile-ducts, may be temporarily relieved by codein or heroin, given hypodermically. For lasting benefit, in most cases, a resort to surgical measures is the only rational treatment, especially where the morbid condition is due to gall-stone obstruction.

Following operative procedures, every care should be given the patient to improve his physical well-being. Rest in bed over a period of time necessary for recuperation should be demanded, while the best of nourishnig foods are taken at regular intervals.

PYLORECTOMY

The removal of the pylorus and adjacent tissue for diseased conditions is denominated pylorectomy. Stricture of the pylorus is the common cause requiring its removal, and this morbid state is the result of cancer or chronic ulceraton. As a complication to the obstruction of the pylorus, dilation of the stomach gradually takes place, giving rise to marked digestive disturbances, catarrh of the mucous membrane, and painful states attended with nausea and vomiting.

The operation being fraught with more or less danger, the surgeon should acquaint himself thoroughly with the anatomy, not only of the pylorus itself, but especially of the adjacent structures, that the morbid changes wrought by the primary disease may be the better understood.

Preparatory to the operative procedure the patient should be toned up with an occasional dose of nitrate of strychnia, the diet should be fluid and very stimulating, and for a day or two previous to the operation the liquid food should be given per rectum. The stomach should be placed in the best of condition by thorough lavage with the alkaline solution previously alluded to, diluted one-half with sterilized water a few hours previous to the operation, and every means should be provided

for in advance to expedite the work and prevent shock. One hour before the patient is anæsthetized, one-thirtieth grain of nitrate of strychnia should be given hypodermically, otherwise the patient should be prepared for the operation in the usual way.

As the nature of the work requires many gauze pads of various sizes, to wall off the contiguous organs, it will be well to have pieces of tape fastened to each and every one of them and as soon as utilized a hemostat should be fastened to the string to make it doubly sure that none are left behind at the conclusion of the work.

With the patient anæsthetized and the stomach thoroughly emptied, a linear incision is made in the median line extending from the ensiform process to the umbilicus. The pylorus is approached through incisions made along other lines, but with no better results, nor giving better opportunities to approach the diseased area.

The soft structures are divided down to the peritoneum, which is picked up between thumb forceps and divided to the extent of an inch or two, making it possible to introduce the index finger for exploratory purposes; with no contraindications, the opening in the peritoneum is enlarged to the extent of five inches or more. The tumor is seized with volsella forceps or the thumb and finger of the left hand and brought well into the abdominal wound, where it is held while sterile gauze pads are packed around it. The omenta attached to the greater and lesser curvatures of the stomach are first secured with ligatures and then cut loose from that organ above the diseased area, securing and ligating any bleeding vessels before proceeding with the work.

On account of the possibility of a misplacement of the adjacent tissues by the tumefaction, great care should be taken not to wound the common bile duct, the portal vein, or hepatic artery, when dividing any of the structures involved in the cancerous mass. If the transverse mesocolon is found extensively involved in the cancerous disease, the operation had better be abandoned, as to proceed farther would greatly endanger the life of the patient. Silk should be used in tying off the omentum or, in its stead, chromicized catgut can be

used and should be placed with a blunt aneurysm needle, care being taken not to include too great a mass of tissue, that the necessary constriction can not be secured to prevent hemorrhage.

After the diseased mass is drawn well out of the external wound and surrounded by hot sterile pads, the duodenum is divided with scissors between two self-retaining clamps. After division, secure at once the severed end of the bowel in several layers of gauze, after disinfecting the presenting portion with some potent antiseptic, the alkaline solution being preferred.

The end of the stomach is then clamped a short distance above the proposed line of incision and the diseased mass cut away with scissors; all bleeding points are immediately secured by ligature or forcipressure and escaping fluids carefully washed or wiped away with sterile gauze sponges, being especially careful not to infect the peritoneal cavity beneath. If, after inspection, the parts involved are found in proper condition, the union of the viscera may be made by an end-to-end anastomosis or a gastro-enterostomy may be done. If the former method is decided upon, the opening in the end of the stomach is reduced in size to that of the duodenum by cutting a V-shaped piece from the side of the lesser curvature and uniting the margins by Czerny-Lembert sutures. The end of the duodenum is now joined to the end of the stomach by uniting the mucous membrane on the posterior surface with fine silk, using a curved round needle and a continuous suture as far around the opening as it is possible to work. The peritoneal surfaces of the stomach and intestine are brought in contact by inverting the margins of the wound and then fixed by placing the interrupted sutures about an eighth of an inch apart, using iron-dyed silk for the suture material and a curved round needle to place it. The Czerny-Lembert form of suture proves the safest in work of this nature.

With the union of the intestine and stomach completed, and the clamps or other retaining medium removed, the connection may be tested by filling the stomach with weak salt water, when, if no leakage occurs, the traumatic area should be sponged dry of all moisture, the protecting gauze pads removed and counted and the external wound closed with silkwormgut sutures without drainage. The wound should be

dusted liberally with some reliable antiseptic powder, a gauze
pad adjusted and held in place with a many-tailed bandage.

No attempt should be made to administer food by way of
the stomach for several days following the operation, nourish-
ment being provided by rectal feeding. The patient may be
allowed sips of hot water occasionally and any rise of tempera-
ture should be reduced by sponging with alcohol and water or
soda water.

If for any reason an end-to-end anastomosis be not feasi-
ble, a gastro-enterostomy may be done as follows: After the
morbid tissue has been removed, the wound in the stomach
is closed by inverting the cut margins after uniting them by
an over-and-over continuous silk suture, a chromicized catgut
suture may do as well. Then the closed margins are further
invaginated and the first row of sutures are reinforced by a
second, including the serous and muscular coats only, using
silk for the suture material and the Lembert form of stitch
in placing them The stomach is next pushed well over to
the right of the patient by an assistant, that the end of the duo-
denum may be readily brought in contact with its posterior sur-
face, where the posterior surfaces are first united with a con-
tinuous silk suture for nearly half of its circumference, leaving
each end of the suture free and long. With a sharp bistoury
an opening is next made in the walls of the stomach, of sufficient
length to correspond with the size of the end of the duodenum,
and about one-fourth of an inch above the row of sutures previ-
ously taken. Arrest hemorrhage by forcipressure and wipe the
margins of the wound dry with a gauze sponge. The borders
of the viscera are then united on the side of the first row of
stitches by an over-and-over continuous suture carried through
the walls of both organs. Then, on the opposite side, the
viscera are united with a continuous silk suture, which includes
only the serous and muscular coats, extending each way to the
commencement and ending of the primary suture placed on
the posterior side. Using the long ends of the primary suture
threaded in round curved needles, a supplementary row of sutures
should be run on the anterior surface of the viscera, including
the serous coats only. The ends of the sutures are cut short

and the gauze pads removed, after which the wound area is wiped dry, and the external wound closed in the usual way.

If in any case the limit of time of operation should prove a feature, a Murphy button may be utilized to join the viscera with a reasonable promise of success.

The physical condition of the patient coupled with the favorable state of the diseased part for removal and the adeptness on the part of the operator to execute the work, all have a bearing on the success of this formidable operation, hence the necessity for carefully preparing the patient for the operative procedure. Being able to outline the tumefaction through the walls of the abdomen is considered by many surgeons of experience, sufficient reason to give an unfavorable prognosis in any attempt to remove the malignant growth.

PERITYPHLITIS

Perityphlitis is an inflammation of the serous membrane surrounding the cecum. There is pain and local tenderness on pressure over the cecum, the patient is restless, there is generally an elevation of temperature and the patient is prone to lie upon the back with the right leg well flexed and in many ways the morbid state resembles a subacute attack of inflammation of the appendix.

A careful examination of a well developed case will note a tumefaction in the region of the cecum which is elongated in shape and gives off a note of dullness on percussion.

In those cases where the inflammatory action runs high, the tissues surrounding the cecum sometimes break down in suppuration, giving rise to a general peritonitis or perhaps to abscess formations that sooner or later find their way to the surface or break into some one of the adjacent cavities of the abdomen, as the bladder, rectum, and even the pleural cavity.

The morbid condition has symptoms in common and may be mistaken for ovaritis, obstruction of the bowel, parovarian abscess, renal calculus, and diseases of the oviducts. A history of the case and close observation of the prevailing symptoms over a short period of time will enable the surgeon, in most instances, to determine the existence of the cecitis.

Treatment. The treatment in the early stages should include the local application of turpentine stupes, libradol, or hot fomentations, with the internal administration of such remedies as the individual case may require. Usually such remedies as aconite, veratrum, dioscorea, bryonia and gelsemium will be specifically indicated at the outset, two or more of them given in alternation and in small doses. Pain may be a feature of the worst phases of the disease which will require an occasional dose of heroin administered hypodermically, but the use of the drug should be limited, as it often destroys the appetite, deranges digestion, and checks the secretions, besides it benumbs the tissues involved permitting changes of a serious nature to take place without any outward manifestation.

The bowels should be kept open with the saline laxatives and the function of the kidneys kept stimulated.

If after a few days, symptoms of perforation occur, which will be noted by sharp pain in the region of the cecum, distention of the abdomen with gas, fall of temperature with cold perspiration and often symptoms of collapse, laparotomy should be performed without delay, the pelvis flushed with normal saline solution and drained after the perforation has been located and closed by suture. The drainage should be in the right inguinal region at the most dependent portion, using iodoform gauze wrapped in rubber-tissue; or a perforated section of rubber tubing.

The treatment following the operative procedure should be in the main supportive, existing conditions governing the administration of medicinal agents. In the absence of fever, peptics and tonics will be beneficial, taken in connection with nourishing fluids foods. The patient should be kept at rest during the period of convalesence, avoiding for some months doing strenuous labor.

PERITONITIS

Inflammation of the peritoneum may be due to any one of several causes, chief among which are traumatism, sepsis, extension of inflammation from abdominal organs, and the presence of foreign bodies.

The disease may be primary or secondary in effect; acute or chronic, according to the time lapsing from the inception of the disease, and local or general according to the extent of the area affected.

In the acute variety, the patient usually gives a history of an injury to the abdomen, or of exposure to some extreme external force as cold or the application of irritating substances to the abdominal skin.

When the disease is primary, it is generally ushered in with a chill followed by fever ranging from 101° to 104° F. The patient is restless, there is marked tenderness on pressure with more or less abdominal pain; there is considerable distention of the abdomen, which is one of the marked characteristic features of the disease. The pulse is generally small and wiry and thirst is a feature, but the patient retains very little fluid on account of nausea, which condition often eventuates in vomiting. The respirations are quickened and the action of the kidneys and bowels is decidedly checked. Acute peritonitis generally runs its course in a week to ten days.

The secondary form of the disease is due to perforation or extension of inflammatory action from contiguous organs, such as the bladder, Fallopian tubes, ovaries, intestines, stomach and the appendix. It may also occur from pyæmia, Bright's disease, and puerperal fever.

When peritonitis is due to perforation, the symptoms usually develop quickly and are more violent in their nature. The pulse is weak, rapid and thready, respirations rapid and often labored, pain very severe and the abdomen distended with gas. The latter state can be verified by making a puncture in the skin with the point of a bistoury through which a small trocar or aspirating needle can be introduced into the peritoneal cavity. Tympanitic resonance over the abdomen, however, is not always evidence that the abdominal cavity is distended with gas, it may be due to distension of the intestines, especially the colon.

Chronic peritonitis is of rather slow development and may be an extension of an acute attack; it is, however more commonly due to some constitutional disease, especially tubercle and carinomatous affections.

The symptoms of chronic peritonitis are not as pronounced as they are in the acute form of the disease. There is more or less pain, but it is likely to be of a colicky nature. There is tenderness on pressure over the abdomen with rigidity of the abdominal muscles. The urine often contains more or less albumen, and is usually scant in quantity; constipation nearly always exists.

Instead of distension, the abdomen is likely to be retracted and the muscles set and hard. Chilly sensations often creep over the system, followed by a slight degree of fever. The appetite is variable and digestion poor, nausea is often a troublesome feature of this form of the disease and vomiting not uncommon. In advanced stages of the disease, ascites sometimes appears as a complication as well as edema of the genitals, feet, and legs.

Stab and bullet wounds of the peritoneum are sometimes responsible for local inflammation of the serous membrane, while general peritonitis is more likely to follow extensive traumatism, and septic infection. The character of the pulse is always the best index to judge of the severity of the disease.

Treatment: The treatment of acute peritonitis will depend largely upon the exciting cause of the disease. The measures adopted, however, should be both medical and surgical.

With the first appearance of the symptoms of primary peritonitis there should be a cleaning up of the patient externally and internally. The patient should be given a sponge or general borax water bath and the bowels should be moved with broken doses of epsom or Rochelle salts. The kidneys will be to some extent stimulated to action by the salines, but occasional doses of citrate of potash in plenty of water can be given with excellent results.

To control the temperature in the early stages of the disease, aconite or veratrum should be given in accordance with the specific indications for these remedies; the small, frequent, wiry pulse, accompanied with rigors, followed by hectic flushes of heat, call for the former, while the latter is given when the pulse is full, bounding, and frequent with a determination of blood to the surface. Either of these potent agents should be added to the indicated remedy to control abdominal tenderness

and pain. Usually dioscorea or bryonia will find a place here, as will colocynth, if the disease is accompanied with diarrhœa and cutting, colicky pains. Gelsemium is an invaluable remedy in the acute form of peritonitis, when the patient is restless and irritable, with a flushed countenance and contracted pupil: it is usually associated with aconite and given in small but frequent doses. Hot turpentine stupes to the abdomen are generally comforting and relieve, in a great measure, the tenderness of the serous membrane; besides, it dissipates the accumulation of flatus that usually forms in the intestinal canal. Equal parts of turpentine and camphorated oil will often do as well and is to be preferred to the stupes with patients whose skin is sensitive to the action of the turpentine.

For the nausea and vomiting that is sometimes a troublesome feature of the disease, various simple remedies may be given; a clove held in the mouth will often relieve the distressing condition, as will little sips of clove tea taken hot. The following mixture, when applied to the nasal mucous membrane, high up, seldom fails to give relief:

℞.
   Cocaine ....gr. x.
   Menthol crystals ....—...gr. ij.
   Alcohol and water, āā ....℥ ss.
   M. Sig.—Apply with small cotton swab every hour or two
   when nausea is present.

Nourishment should be taken in fluid form and hot, that the stomach may be kept in as normal condition as possible, care being taken not to overfeed the patient.

To relieve thirst, sips of hot or cold water may be taken freely, if the patient can retain it.

Severe abdominal pain may require an occasional dose of heroin given hypodermically, but the use of the drug should be limited, as it has a tendency to check the secretions and nauseate the patient.

When the disease is due to septic infection, remedies having an antiseptic and stimulating effect should take the place of those previously mentioned, except such as were suggested to open the bowels and to apply externally to the abdomen.

In the early stages of sepsis, the following prescription may be given with benefit:

℞.
    Spc. Tr. Echafolta ....℥ iij.
    Spc. Tr. Digitalis ....gtt. x.
    Peppermint water, q. s. ....fl. ℥ iv.
M. Sig.—A teaspoonful every two to three hours, alternated
    with teaspoonful doses of the following mixture:

℞.
    Spc. Tr. Prunus ver ....℥ j.
    Fowler's Solution ....℥ ss.
    Camphor water, q. s. ....fl. ℥ iv.
M. Sig.—Given in teaspoonful doses.

If there is still abdominal tenderness, Lloyd's libradol
should be spread on a piece of canvas and applied over the pain-
ful area once or twice a day. Feverish states should be relieved
by sponging with soda solution as often as the conditions may
require.

Operative measures give the only hope of relief in cases
where the morbid condition has passed on to suppuration. The
patient should be prepared as for laparotomy and anæsthetized.
The abdomen should be opened in the median line and the peri-
toneal cavity flushed with normal saline solution at a temperature
a little above that of the body, to free it of purulent and fibrous
fluids which usually break down rapidly, forming a culture bed
for pyogenic and other septic germs. This process should be
thoroughly done, followed by establishing ample drainage at
one or more dependent portions of the abdomen.

The treatment generally required in the chronic form of
peritonitis by remedial measures should be largely supportive;
indication for remedies should be especially sought for. In
those cases where edema of the tissues is in evidence, or where
they are cold and clammy with a general lack of tonicity, the
specific tincture of apocynum alternated with small doses of
Fowler's solution of arsenic will be of marked benefit in most
cases. Collection of ascitic or purulent fluids within the peri-
toneal cavity should be evacuated by abdominal section and
drainage established. The bowels should be kept open and the
function of the kidneys kept stimulated. If the urine contains
albumen, the patient should be be put on a strictly milk diet,
and given small doses of the infusion of digitalis for a short
time only. The acid solution of iron, in two or three drop
doses in water, is also useful in these cases.

It will be well to flush the abdominal cavity after evacuating the purulent fluid, with normal saline solution, as the fluid in a measure prevents intestinal adhesions.

As soon as the condition of the patient will justify the taking of a liberal diet, eggs, meat juice, rich broths, soup, ice cream, jellies, and well cooked fowl, should be allowed in moderate quantities.

Nothing short of operative measures can give any promise of relief in inflammatory states of the peritoneum when due to the presence of foreign bodies; the nature of the operation will be suggested by the special features of the individual case. Stab and other wounds of the serous membrane often give rise to symptoms requiring opening the abdomen and establishing drainage.

Inflammation of the pelvic peritoneum is usually due to extension of inflammation of the ovaries, tubes, and uterus, or to traumatism.

In connection with the administration of such remedies as are specifically indicated, and the topical application of fomentations, turpentine stupes, or libradol, an opening should be made through Douglas cul-de-sac and drainage established as soon as suppuration occurs. The vagina may be flushed with antiseptic solutions and afterward packed with iodoform or other sterile gauze.

DISEASES OF THE OMENTUM

The omentum being composed of highly vascular tissue is subject to morbid conditions of a more or less serious nature. This structure is especially liable to inflammatory action, as a result of traumatism, infection, and extension of inflammation from adjacent structures.

The symptoms usually indicative of inflammatory action are fever, soreness and constrictive pain throughout the abdomen, tenderness on pressure with more or less digestive disturbance. In cases where the inflammatory action terminates in suppuration, the patient will experience rigors and the fever will be of a hectic type; the tongue will be furred, pulse rapid and cord-like, and thirst pronounced. **Gaseous eructions are**

frequent, and constipation soon becomes a feature. The disease terminates in resolution or ends fatally within a few days.

Treatment: The treatment of omental inflammation will vary to meet the exciting cause of the disease, and the indications for remedies present in each individual case. The acute form of the disease uncomplicated, with a rapid small pulse, flushed face, constrictive pain in the abdomen, with tenderness on pressure, should do well on the following prescriptions given alternately:

R.
Spec. Tr. Aconite .... gtt. x
Spc. Tr. Gelsemium .... gtt. xx
Peppermint water, q. s. .... fl. ℥ iv.
M. Sig.—A teaspoonful every hour or two.

R.
Spc. Tr. Aconite .... gtt. x.
Spc. Tr. Dioscorea .... ℥ j.
Aqua Dest. q. s. .... fl. ℥ iv.
M. Sig.—A teaspoonful given every hour or two alternated with the other medicine.

Existing conditions likely to result in suppuration, unless checked in the degenerative process, should be put upon liberal doses of specific echafolta, alternated with such other medicinal agents as seem to be indicated; acid solution of iron, if the tongue is red and broad; sulphurous acid, when the tongue shows red, dirty and slimy; and sulphite of soda, if the tongue is broad and pallid with a dirty coating.

Stimulants are admissible during the progress of the disease in the absence of high fever, in cases threatened with collapse, and can be taken by mouth or administered hypodermically; attenuated doses of nitrate of strychnia and solution of adrenalin chloride giving the most support to the heart and flagging nervous system.

The application to the external surface of the abdomen of dilute guaiacol will prove of service in these cases, as will a mixture of turpentine and camphorated oil, one part of the former to two of the latter. Turpentine stupes to the abdomen are often used with much benefit to the patient, so are fomentations of hops and tansy leaves.

Abscess formations may be relieved by incision and drainage, but the prognosis is unfavorable in these cases.

The nausea and vomiting that is such a distressing feature in many cases, may be relieved with sips of clove tea, iced ginger-ale, dilute hydrocyanic acid, or infusion of peach tree bark. Other symptoms will have to be treated as they arise.

The diet during the convalescence should be selected with due regard to the requirements of the individual case and the ability of the stomach to digest food. Broths, rich soups, egg albumen, ice cream and koumiss can usually be taken in small quantities, and the juices of fruit are nearly always taken with a relish. Water should be drunk freely; the patient should be kept quiet in bed until well advanced on the road to recovery.

Tumors of the omentum will have to be removed surgically when they are operable. That part of the omentum involved in the morbid condition should be tied off in sections before the vascular membrane is divided. At the conclusion of the work the abdominal cavity should be cleared of bloody fluids and the external wound closed in the usual manner.

OBTURATOR HERNIA

A protrusion of a knuckle of intestine into the obturator foramen may exist for a long period of time without provoking unpleasant symptoms, except strangulation of the presenting part takes place. If the hernia be complete the knuckle of intestine rests in the thyroid space in contact with the vessels and nerves.

This form of hernia is exceedingly rare and the diagnostic symptoms rather obscure. When the hernia is pronounced, the patient complains of an uneasy feeling in the upper part of the thigh, which is, no doubt, due to pressure upon the nerve filaments by the protrusion.

A macroscopical examination will in most cases, note a fullness in the upper and inner side of the thigh in the region of the pectineus muscle. There is usually more or less tenderness on palpating the part, especially if the protruding knuckle be distended with gas. In case of strangulation, violent symptoms soon appear; pain of a griping, cutting character accompanied by tenderness on pressure over the swelling, is char-

acteristic of the morbid state, as are nausea and vomiting, with extreme restlessness. If the morbid condition be not soon relieved, the bowels will become distended with gas, the frequent desire to evacuate the bowels gives no relief, nor does the belching of gas from the stomach relieve the tension or pain in the abdomen. The pulse becomes wiry and rapid, and the features present great anxiety, and in extreme cases the patient lapses into an exhausted state and the surface of the body is bathed with cold perspiration.

As before stated, the real condition existing in a strangulated obturator hernia is often obscure, and because of this, many a case has gone into collapse and finally succumbed, the real cause of death being ascertained at the post mortem.

Treatment: The treatment of an incarcerated thyroid (obturator) hernia if not complete, may be relieved by proper taxis, but the manipulative work is somewhat embarrassed, owing to the amount of tissue resting over the constricting medium. Before making taxis the patient should be placed upon his back, with head and shoulders lowered and leg flexed to relax the tissues. If any circumstances connected with the individual case contraindicate manipulative measures an operation should be decided upon at once.

After the external field has been rendered thoroughly aseptic and the patient placed under chloroform, a five-inch incision should be made over the center of the tumefaction, parallel with the femoral vessels and about an inch to the inner side of them. The skin, fat and fascia is divided down to the pectineus muscle, which is then exposed and pulled far to one side with retractors, or divided, as well as other muscular structures that prove an obstruction to a ready approach to the seat of constriction.

Before attempting to incise the constricting medium, the exact location of the femoral vessels and nerve should be ascertained to prevent injuring them if possible. In complicated cases, it will be better to insert the tip of the forefinger into the foramen, beside the protruding viscus, and with the edge of the nail tear the margin of the constricting tissue, allowing the incarcerated knuckle of intestine to return into the abdominal cavity. The hernial sac should then be pulled slightly down-

ward and a ligature of silk thrown around it high up, below
which, at a safe distance it should be cut away with scissors
and the stump returned within the abdomen. Local conditions
that would contraindicate the above procedure would be where
the constriction had caused gangrene of the protruding knuckle
of intestine, requiring the necrotic portion to be removed and
the distal end fastened to the margin of the skin wound, thus
forming an artificial opening as in enterostomy.

In the former case, after the bowel and sac have been re-
turned to the abdominal cavity, the hernial opening is drawn
together with chromicized catgut, over which the external
wound is closed in the usual way, and dressed antiseptically.
The patient should be kept at rest in bed for three weeks or
longer, or until the traumatism has completely healed.

The method of dealing with a strangulated hernia in the
thyroid foramen will outline the course to follow in a hernia
in the great sacro-sciatic foramen.

AFFECTIONS OF MESENTERY

The mesenteric vessels and glands, including the folds of
peritoneum enclosing them, are subject to wounds and morbid
changes produced by tumors both benign and malignant. Of
the benign variety, the fatty growth and fibromata are the
most frequently met with, although the cystic tumor is often
found within the folds of peritoneum. Of the malignant tum-
ors, the sarcoma is the most commonly found springing from
the mesentery, while tuberculous growths are not uncommon.

Traumatic lesions of the mesentery are usually the result
of stab and gun shot wounds and vary in severity in proportion
to the extent of the injury. The prominent symptoms follow-
ing such injuries are acute pain and physical weakness from
hemorrhagic losses.

The symptoms accompanying the presence of tumors com-
plicating the mesentery are feeling of tightness, distress, and
pain in the abdomen, which becomes more intense as the mor-
bid condition increases. In advanced malignant cases there are
likely to be rigors, followed by hectic fever, accompanied by

thirst, restlessness, furred tongue, with marked digestive disturbances.

Treatment: The treatment of these morbid conditions is entirely surgical, wounds will require immediate laparotomy and clearing the abdominal cavity of blood-clots and other fluids, the securing of bleeding points with ligature, and closing the wound in the mesentery with silk or catgut. Tumors, when small, may be removed without endangering the blood supply to the intestine to a damaging extent. When large, removal is not to be attempted. Cystic growths should be incised, the cavity drained through the lower extremity of the abdominal wound, which should be closed with silk-wormgut sutures.

The medium for drainage should be a perforated glass tube or a cigarette drain, made by enclosing strands of sterile gauze within a suitably sized piece of rubber protection tissue. The length of time that the drainage tube should remain in place will depend upon the progress the morbid state makes toward recovery.

INTUSSUSCEPTION

This morbid condition may occur at any portion of the alimentary track but is most frequently observed at the junction of the ileum with the colon; these parts, forming the ileocæcal valve, are not infrequently invaginated into the colon, causing complete obstruction of the bowel. The painful condition occurs most frequently in early life and is due to several causes, chief of which are intestinal parasites, diarrhœa, dysentery, and morbid growths.

The symptoms attending the involution are those common to occlusion of the alimentary canal from other causes. Pain and tenesmus are always present, usually preceded by mucoid discharges from the bowels which are often tinged with blood. Hiccough and physical collapse precede the fatal ending of the case.

Treatment. The treatment should be along surgical lines from the first. The patient should be prepared for a laparotomy and given a general anæsthetic, unless too weak to withstand the effect of the lethal agent; if so, the work may be executed

under the influence of a potent local anæsthetic. A four per cent. solution of novocain or cocaine with a solution of adrenalin chloride being used for the purpose, the former being far safer than the latter and just as efficient.

The abdomen may be opened in the median line and the part involved in the invagination sought and reduced by taxis if possible. The procedure should be done with care in cases of some time standing, as otherwise serious damage may result to the parts that have become fragile from morbid changes in structure The after care will be the same as the patient generally receives in laparotomies for other abnormal conditions.

Efforts to reduce the invagination by distending the bowel below it with high enemas of warm water in which a small amount of biborate of soda has been dissolved have, in favorable cases, resulted in relief of the obstruction, but time should not be lost in repeated trials if the first two or three injections do not bring results. Gas is often used instead of water to distend the bowel, with better results in most cases.

DIAPHRAGMATIC HERNIA

A knuckle of intestine may protrude through a stab-wound or a preternatural opening in the plane of the diaphragm. The symptoms accompanying the morbid state will depend on whether or not strangulation exists; if it does, there will be nausea and vomiting, abdominal pain with intestinal distention with flatus; there is tenesmus, but the bowels are generally bound. Unless the critical condition is early determined and relief quickly given, the patient becomes restless, the pulse quickens and is irregular, the tongue is red and dry and the teeth soon coat over with sordes; there is great thirst, but water and other fluids are ejected soon after being swallowed. Later the features become worried and pinched, prostration is evidenced by a weak pulse and cold perspiration, and death soon follows from exhaustion.

A differential diagnosis is to be made from gall-stone colic, and intestinal obstruction from other causes.

Treatment: The treatment consists in making an exploratory incision in the abdominal wall and if a hernia is found to

exist, the wound is enlarged and the rent in the diaphragm extended with the finger, if seen early, but should the bowel be found in a gangrenous state, great care should be exercised in liberating the impinged loop that it is not ruptured and the foul pent up fluid spilled into the abdominal cavity; to prevent this accident from jeopardizing the life of the patient, the viscera involved in the procedure, should be surrounded with sterile gauze pads. After the incarcerated portion is liberated, if found in a state of gangrene, it should be resected and the ends of the gut united with a Murphy button or iron-dyed silk, over a large gelatin capsule, using the Halstead form of suture; this done, the rent in the diaphragm should be closed with silk or twenty-day catgut, using a curved round needle to place the sutures. After cleansing the abdominal cavity of bloody fluids, the external wound is repaired in the usual way and the patient put to bed and cared for the same as for other abdominal operations of a like nature.

It is well to remark in this connection that should it be found necessary to remove the incarcerated portion of the gut and the end-to-end anastomosis over the gelatin capsule is executed, pressure should be made over the capsule sufficiently to abridge or lessen its size to prevent it obstructing the bowel.

BILIARY CALCULI, GALL-STONES, CHOLELITHIASIS

Biliary calculi are brownish concretions, composed principally of bile-pigments, cholestrin, lime mucus and taces of magnesia, emanating from the secretions of the gall-bladder. These biliary elements may combine to form one large, round, lithe or calculus nearly or quite filling the gall-bladder, while in other cases numerous stones are found, many of them presenting small facets, produced from constant attrition from coming in contact with one another.

It is generally supposed that gall-stones result from obstruction of the ducts which cause defective drainage of the gall-bladder; thus the flow of bile is impeded and concretions formed. As another result of defective drainage, a catarrhal

state of the gall-bladder ensues and later active infection through the destructive influence of the bacillus colli communis, typhoid bacillus, and the pyogenic germs.

There are no symptoms of forming gall-stones manifested till the calculus assumes sufficient size to cause impaction; but as soon as this takes place the patient becomes jaundiced, especially after an attack of biliary colic; there will be periodical attacks of nausea and vomiting, as well as sharp lancinating pain, radiating from the epigastric or hypochondriac region, often following the hepatic branches of the pneumogastric to the main trunk of this nerve and reflected throughout the region of the right shoulder. During an attack of hepatic colic, there is usually acute tenderness over the region of the gall-bladder and marked rigidity of the overlying muscles. The above symptoms are more pronounced when the common bile-duct is the seat of obstruction, when the cystic duct is the seat of obstruction, jaundice is not so pronounced, but does occur when the gall-bladder becomes fully distended, giving rise to pronounced pressure symptoms. Marked depression, attended with profuse perspiration, usually follows immediately an attack of hepatic colic. Not infrequently a stone may be found in the dejections, following an attack of colic; and to be able to discover it, the fecal matter should be passed through a sieve by the aid of quite warm water and a whisk broom.

When the cystic duct becomes occluded, the gall-bladder becomes distended with a mucoid fluid, often assuming the size of a goose egg, and can be outlined through the abdominal walls.

Grave complications often accompany aggravated cases of gall-stone; the common sequelæ being ulceration and escape of the lithe into adjacent cavities, stricture following the ulcerative process, intestinal impaction from hepatic calculi, secondary abscess formations, atrophy of the gall-bladder, also empyema of this organ.

The treatment during an acute attack should consist of hot applications over the region of the liver; the best for this purpose is the hot fomentation of hops and stramonium leaves. If the pain is severe, give one-sixth of a grain of hydrochloride of heroin hypodermically over the region of the liver; often

much benefit will result from adding to the heroin injection one one-hundred and fiftieth of a grain of atropin. If for any reason, the heroin should be contra-indicated, the patient should be given chloroform by inhalation to the extent that pain be assuaged, while the stone is passing through the duct. The stomach should be kept free from food during these attacks, and but little water should be drunk. If any is allowed, hot water should be sipped, a little at a time. Quite warm saline solution can be given per rectum occasionally with some advantage by way of stimulating the depressed state, and also by relieving thirst.

As soon as the acute symptoms pass away the patient should be given liberal quantities of olive oil to the extent that free movements of the bowels ensue. Allow the patient to drink freely of apple cider at all times, when it can be obtained moderately fresh. In the absence of cider, tart lemonade should be substituted.

A vegetable diet should be freely resorted to, with the exception of potatoes. Lettuce and young onions made into a salad with olive oil and lemon juice, with or without the addition of sugar, is both appetizing and remedial. The fresh leaves of young dandelion and spinach, also fresh dock leaves, cooked till tender and served with a mayonnaise dressing, made rich with olive oil, will serve a good purpose as an article of diet.

The cereals may be eaten in the form of mush or made into soup. Meat should be eaten sparingly, although beef-juice and mutton-broth are permitted and are usually taken with a relish. Graham bread should be allowed, but not bread made from finely bolted flour. Dried fruits, such as figs, prunes, peaches and raisins, eaten in the form of sauce are nutritious and will aid in overcoming constipation. Sweets in any form generally disagree by forming gases in the gastro-intestinal tract.

Just when the case ceases to be medical and becomes one for surgical interference, depends entirely upon the gravity of the symptoms of each individual case. There is little doubt but what a surgical procedure would be justified in a case that presented frequent attacks of biliary colic, increasing in severity and in cases showing persistent jaundice, empyema of the gall-

bladder, abscess formations, persistent pain, indicating plastic adhesions, and rapidly failing health.

After the surgical toilet of the patient has been completed, and the patient anæsthetised, make an incision five inches in length over the tumor, parallel with the outer border of the rectus muscle, the center being on a line with the tumor. Or an incision can be made parallel to the lower border of the ribs: extend the incision down through the overlying structures till the peritoneum is exposed. Open this membranous structure to the extent of the external incision, retract the edges of the divided tissues and pack the peritoneal cavity with sterile gauze sponges. Carefully bring the gall-bladder forward into the traumatic opening, unless prevented by adhesions. The common and the cystic ducts should now be palpated between the thumb and fore-finger to discover, if possible, the location of the lithe, if one exists; this can usually be accomplished with the finger in the foramen of Winslow and the thumb compressing the tissues above. If the stone is located near the mouth of the cystic duct, it may be forced back into the gall-bladder and if it has passed into the common duct, it may be hurried on into the bowel by expression. Being unable to accomplish this procedure, the duct is incised over the calculus after a suture of catgut has been passed on a full curved needle on either side of the proposed incision and the stone turned out. If the injury to the lumen of the duct is slight, close the incised opening with cat-gut, without drainage; otherwise a gauze drainage should be placed against the opening in the duct, first wrapping the strand of gauze with a leaf of rubber tissue and bringing it out through the incision in the overlying soft structures. This drainage gauze should remain in place three to six days as the after condition of the case will determine.

To remove a stone from the gall-bladder it is best to draw off the fluid by aspiration first, then incise the bladder at the site of the puncture, sufficient to remove the stone after which, if the injury to the cystic walls and adjacent parts be inconsiderable, the opening is closed with catgut sutures and drainage provided for as in the treatment of the impaction of the cystic and common ducts. In cases of extensive cystic enlargement, where the sac can be brought in apposition with the

incised edges of the peritoneal wall, stitch the cyst walls in the upper angle of the wound with catgut or fine silk and drain with a piece of rubber tubing. In a few days the tubing can be removed, at least as soon as the biliary secretions become normal in appearance. The external wound is closed with silkwormgut, which should include the skin and underlying structures.

Ligating the ducts and ablation of the gall-bladder are frequently resorted to in marked atrophy of the organ in cases of gall-stone, especially when the cyst is so contracted that it cannot be sutured to the abdominal parietes after it has been opened.

The patient should be placed in bed and enjoined to remain as quiet as possible. Treat the conditions as they arise; controlling feverish states by sponging with soda and water, keeping the bowels open and giving an occasional dose of bromide of soda (five grains) or two drops of tincture of veratrum.

COLOSTOMY

Colostomy is the technical term for the operation performed to open the colon after it has been brought to the surface through an incision made in the soft parts over the gut.

The operation is resorted to for relief from malignant tumors, extensive ulceration, and congenital malformations of the rectum and anus. The left inguinal region is usually selected for the operation for the relief of morbid states existing in and below the sigmoid flexure, and the colon is opened in the right inguinal region for obstruction lesions at any point of the ascending gut. The operation can be done in the right or left lumbar region, with the same end in view, but the work is not as easily executed, and the mortality is greater and the period of recovery is fraught with graver complications. The mortality is about two per cent in inguinal colostomy, while it is given at ten per cent in the lumbar operation.

A smaller incision is required when the operative work is done in the inguinal region, and the bowel is more easily followed, and morbid states detected; besides the operation can

be done under local anæsthesia, a point favorably considered by many. Another great advantage soon realized by the patient, when the bowel is opened in the inguinal region, is the better control of fecal discharges, by modern methods, than can be accomplished in the lumbar operation. The one advantage that the lumbar operation can claim over the inguinal is being able to reach and open the colon without entering the peritoneal cavity in obstructed states of the gut.

Procidentia or prolapse of the bowel is a troublesome complication, frequently following either inguinal or lumbar colostomy, and is due mainly, to a faulty incision, or misplacement of the fixation sutures, and may be both. It does not follow inguinal operations as frequently as it does those performed in the lumbar region.

The operation for artificial anus is often preceded by an exploratory incision to enable the surgeon to locate the nature and cause of the obstruction; the incision for this purpose is usually made in the middle line, between the umbilicus and the symphysis pubis. After the nature of the obstruction has been ascertained, if it be in the sigmoid flexure or below it, an incision about three inches long is made parallel with Poupart's ligament and about one and a half inches from it, commencing a little above the anterior superior spine of the ilium, and terminating on a line corresponding with the center of Poupart's ligament. The incision is carried down through the soft parts overlying the colon, until the peritoneum is reached, but before this structure is opened, all bleeding points should be clamped or ligated. The peritoneum is then opened to the extent nearly, of the incision in the skin and muscular structures. This incision is commenced with a knife and completed with scissors upon the finger inserted in the wound to protect the bowel. The edge of the peritoneum is now sutured to the skin, placing three sutures on each side, using plain sterile cat-gut for this work.

The second step in the operative work is to place a silk suture through the skin and muscular tissue about one-half inch from the upper angle of the wound, and another about the same distance from the lower angle of the wound, as indicated in the cut and marked A. D., and left untied. The colon is
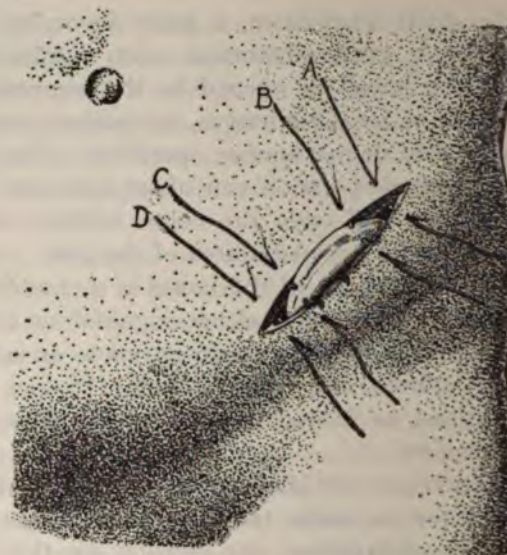
Fig. 149.—Colostomy. The descending colon drawn into
the incision and fixed; *A, D*, sutures placed through all the
layers of the abdominal wall, including the peritoneum; *B,
C*, sutures passing through all the layers of the abdominal
wall, including the peritoneum, also passing through the wall
of the gut in their course. (*McGrath*.)

now fished up from the abdominal cavity with the fore-fingers
and anchored in the gaping abdominal incision with silken su-
tures, which are inserted through the skin, muscular structures,
and peritoneum on both edges of the wound; while placing
these sutures, of which there should be two, the needle will pick
up a good bite of the serous and muscular coats of the gut, as
shown in the cut marked B., care being taken not to penetrate
the lumen of the colon. These anchor stitches should be about
two inches apart, tied securely as soon as placed, as are
those in the upper and lower angle of the wound in the ab-
domen, thus fixing the gut in the incised wound. In order to
more thoroughly anchor the knuckle of the colon in the wound,
it will be well to place about three provisional sutures of fine
silk on either side, each of which should pass through the serous
and muscular coats of the gut and the several layers of the
edges of the wound, including the peritoneum. This part of
the work is best accomplished with a curved intestinal needle,

and in cases requiring immediate opening of the bowel, the anchorage may be accomplished by a continuous over and over suture.

If possible the opening of the bowel had better be deferred for two or three days to permit adhesions to take place between the bowel and the skin. The bowel is opened between two forceps that pick up the serous coat of the gut to the extent of an inch and a half, the incision made longitudinal and in the most prominent part of the exposed intestine. This method is preferred by most surgeons when opening the gut for a temporary inguinal anus in rectal obstruction or other morbid states that can be corrected by mechanical or surgical methods, the opening in the bowel being closed later and returned to the abdominal cavity, after dissecting the gut loose from the edges of the wound made in the abdominal walls, with the exception, perhaps, of the parietal peritoneum, which is adhered to the under surface of the gut, and which should be detached in most cases to the extent of about three inches from the overlying muscular wall, immediately around the wound, thus allowing the return of the bowel within the abdomen without entering the peritoneal cavity. The abdominal wound is then closed with catgut or silk-wormgut sutures, after the edges of the several layers of tissue have been freshened by the removal of cicatricial tissue.

The method chosen for closing the incision in the bowel will depend upon the kind of incision made at the primary operation, and the complications, if any, that followed the operative work. To close a longitudinal or transverse incision made for temporary purposes, a row of Lembert sutures are placed, using iron-dyed silk, or catgut for the work. In complicated cases, especially where, for various reasons, a section of the gut has been excised, a lateral or end-to-end anastomosis is done with iron-dyed silk or the Murphy button. Occasionally a case will not heal kindly, and a fecal fistula will result and delay the healing process; if such a complication arises, the patient should be kept in bed, a diet prescribed of soups, bread and butter, rice and cream, eggs and milk in moderation, avoiding fruits, vegetables and acids, and other articles of diet that tend to produce frequent liquid stools. Cauterizing the fist-

ulous track every other day with a ninety-five per cent phenic acid, followed by a packing of sterile gauze, will stimulate granulations and a rapid closing of the sinus.

A common complication in colostomy, and a troublesome feature, especially in permanent cases, is prolapse through the artificial opening in the colon. To obviate this complication, the gut should be well extruded through the abdominal incision before it is anchored to the edges of the wound. Cases where the mesentery of the colon is exceptionally long will demand the above precaution. In all cases of this nature, the excess of intestine should be cut away, and an end-to-end anastomosis done with a Murphy button, unless a permanent artificial anus is desired.

The after-treatment for morbid states, following colostomy, will depend upon the symptoms and condition of each individual case. There is more or less disturbance of the function of the bowels, some distress from accumulation of gas, but very little pain in and around the wound, after the first twenty-four hours. The passing of fecal matter through the artificial anus, frequently soiling the dressings, and the unavoidable escape of intestinal gas, proves very annoying to the patient until the action of the bowels can be governed by paying attention to the action of the several articles of food upon them. Patients are usually confined to the hospital for about three weeks, after which time, they are permitted to be up and about. The dressings required for the artificial anal opening will be a pad of gauze and cotton held in place by a T-bandage.

CHOLECYSTITIS AND CHOLANGITIS

Cholecystitis is an inflammation of the structures of the gall-bladder, and is caused either by the impaction of biliary calculi or the extension of a catarrhal inflammation from the bile ducts.

Cholangitis has special reference to an inflammatory action existing in the bile ducts leading from the gall-bladder and body of the liver to the intestine. The effect of this action is to fa-

vor the formation of concretions of bile within the ducts or gall-bladder.

The morbid state exists in the acute and chronic forms, the former being generally characterized by sharp colicky pains, while the latter form of the disease is attended by a soreness and tenderness upon deep pressure over the region of the gall-bladder. There is more or less pain, but not of an acute character.

The symptoms attending the inflammatory state of the gall-bladder and bile ducts vary in accordance with the size and number of the stones, as well as the point in the ducts at which they find lodgment. The general symptoms noted in inflammation of the gall-bladder are colicky pain, tenderness on pressure, restlessness and fever, and the presence of a tumor in the region of the gall-bladder in the majority of cases of distension of the gall-bladder with calculi or bile-fluids. When the ductus communis choledochus becomes occluded, other symptoms besides the ones enumerated soon develop, chief of which is a jaundiced condition, more or less pronounced in character. Abscess formations along the tributary branches of the bile ducts throughout the liver often follow infection of the morbid secretions in advanced cases of cholangitis, which condition gives rise to additional symptoms, in the form of rigors, hectic fever, thirst and digestive disturbances. Symptoms of the disease are mostly confined to the region of the gall-bladder, unless perforation of the latter takes place; in such cases there is, in connection with many of the above mentioned symptoms, general abdominal tenderness, nausea and vomiting, and distension of the abdominal walls. Many of the above symptoms may be relieved spontaneously early in the progress of the morbid disease if the medium obstructing the bile-duct gives way and passes out into the intestinal canal, or the inflammatory action is subdued by proper treatment, thus relieving the swollen and congested state of the ducts.

Treatment: The treatment of inflammation of the gall-bladder and ducts is by both remedial and surgical measures. If the nature of the disease be determined early in its career, the bowels should be opened with the compound podophyllin pill, composed of the following ingredients:

℞.
    Podophyllin .... gr. ij
    Phosphate Hydrastia .... gr. vij
    Ext. Glycyrrhiza .... gr. x
    Lactin .... ℥ j
M. Sig.—Make pills No. thirty. One as often as may be
    needed to keep up a free movement of the bowels.

It may be well to give an occasional dose of some one of the saline cathartics in connection with the laxative pills above mentioned in the early part of the treatment. If the patient shows a sallow or yellowish tongue and mucous membrane, and a jaundiced state of the skin, with high-colored urine and clay-colored stools, the specific effect of chionanthus and chelidonium upon the liver and its secretions should be considered. Specific belladonna will be indicated by a sluggish circulation and a throbbing sensation in the hepatic region, and dioscorea for abdominal pain. Bryonia, associated with veratrum, is indicated in feverish states, with cutting pain in the region of the liver made worse by moving about. Olive oil in teaspoonful doses three or four times a day, is of great benefit in every case of cholangitis, especially in cases where the prevailing symptoms point to threatened occlusion of the hepatic ducts with concretions of hardened bile secretions.

As an aid to relieve local tenderness and pain the patient should be put at rest in bed, and Lloyd's Libradol applied over the painful area as often as the character of the pain will require its use. Spts. of turpentine and camphorated oil, well rubbed in over the region of the gall-bladder three times a day, followed by hot pads, is not without some benefit in these cases.

If the morbid disease does not yield to the above treatment within a reasonable time, and the symptoms become gradually more grave, surgical measures should be resorted to. The patient should be prepared as for laparotomy, the abdomen opened, the gall-bladder and bile ducts exposed by elevating the anterior border of the liver; the point of obstruction is sought, and, if found, the morbid condition should be corrected. The technic of the work is given under the head of **Gall-stones**, in another part of this volume.

Not infrequently the bile ducts, and even the gall-bladder, will be found in a suppurative state, especially in subacute and

chronic cases. This condition requires the opening up of the exposed portion of the biliary track and the evacuation of the purulent fluid and any existing morbid matter, and the establishment of suitable drainage from the septic field down through the abdominal wall. A section of sterile rubber tubing, three-eighths to one-half inch in size, well perforated at the inner end, makes a suitable medium for the purpose. With the drainage tube in place, the abdominal incision is closed in the usual manner, and the external wound dressed with sterile gauze, and a bandage applied. The patient should be kept at rest in bed, in a cool and airy room. The diet should consist of soup, broths, rice, custard and malted milk. Lemonade, the juices of fruit in water, and plenty of fresh water, are permissible in most cases.

After recovery the patient should be instructed to live an out-door life, and to drink freely of mineral springs water. Complications, if they arise during convalescence, should be treated according to the existing requirements.

CANCER OF GALL-BLADDER

Cancer of the gall-bladder is occasionally met with in general surgical practice. While affections of this character are usually secqndary, they have been observed where the history, without doubt, points to the devitalizing disease having a primary origin. The morbid disease is generally preceded by a pronounced inflammatory action of the bile ducts that soon spreads to and involves the gall-bladder.

Usually the first symptoms noted in the malignant disease are nausea and vomiting and digestive disturbances coming on a short time after eating. As the disease progresses, the complexion turns a yellowish hue, which becomes quite marked soon after a severe spell of vomiting.

In advanced cases, where from pressure the escape of the bile fluid fails to reach the intestines through the ducts, a dropsical condition soon sets in, which sooner or later proves a serious complication to the original disease. Pain and distress are features of the ailment, but not diagnostic symptoms of the real condition, as the same symptoms accompany occlusion

of the bile ducts with impacted calculi; but when the above symptoms are attended with loss of flesh, and the patient becomes anemic and at the same time the presence of a growth can be outlined in the region of the gall-bladder, the true nature of the ailment is suspected; yet it requires opening the abdominal walls and exposing the affected parts to determine a correct diagnosis.

Treatment: The treatment of carcinoma of the gall-bladder consists of surgical means only, and, to be in any measure successful, the work must be done during the early phases of the disease. At this time, a cholecystectomy may be executed, even removing a portion of the liver surrounding the gall-bladder, if the devitalizing disease has involved that part of it.

Not much promise of relief should be entertained in cases where the cancerous growth involves the bile ducts; efforts have been made to join the gall-bladder to the duodenum or colon, and portions of the bile ducts have been implanted in the adjacent intestines after the resection of the growth, but the results have not been such as would encourage the operator to place much reliance in the operative procedure. As a rule, the nature of the disease is not discovered until it is far advanced; hence, nearly all cases prove fatal within a few months from the appearance of the first symptoms of the disease.

CHOLECYSTOTOMY

Incision of the gall-bladder is resorted to for the purpose of exploration or for removal of tumors and foreign bodies.

For the execution of this work, the patient should be prepared as for a laparotomy. A vertical incision four or five inches in length is next made downward from a point opposite the tip of the ninth costal cartilage along the line of the linea semilunaris at the outer side of the rectus muscle, dividing the soft structures down to the parietal peritoneum, which is then picked up with mouse-toothed forceps and divided to the extent of the external incision. The condition of the gall-bladder and its surroundings is next determined by an examination with the finger. Occasionally the gall-bladder will be found adhered to the ab-

dominal wall by inflammatory adhesions, more or less dense in character, making the operation extra hazardous. If the gall-bladder is distended with fluid or from the presence of a stone, it will be found projecting from beneath the anterior margin of the liver or if it is small or collapsed it will be found concealed beneath the margin of that organ.

If conditions are favorable, the gall-bladder is brought up into the external wound, where it is held with two or more silk traction sutures, which are passed through a small portion of the muscular wall of the cyst, while its contents are evacuated with a suitable sized aspirating needle, if it is fluid before it is incised. The incision need not be of a greater length than will admit of the finger or the extraction of a large calculus, if one exists. To prevent the soiling of the peritoneum with the .cystic contents, the margins of the abdominal wound should be protected with sterile gauze pads.

The opening in the gall-bladder, which is generally made near the fundus, is next closed with a double row of sutures, the first being of cat-gut, including all of the coats of the cystic wall, the second should be of silk Lembert sutures and include the serous and muscular coats only. This row re-inforces the first one taken, which is turned in or buried. The pads are next removed and the wound cleared of operative fluids. The edges of the peritoneum are then approximated and closed with cat-gut, and the overlying structures with silk-wormgut, which should include all of the remaining tussues of the abdominal wall. The abdominal wound is then dressed in the usual manner, a bandage applied and the patient placed at rest in bed.

CHOLECYSTOSTOMY

The establishment of a fistulous opening in the gall-bladder for the purpose of drainage, is sometimes required in gall-stone collections in the hepatic ducts and other morbid conditions of these parts.

The gall-bladder can be exposed through a vertical incision as recommended in cholecystotomy or through a four-inch oblique incision one inch internal to the free border of the ribs,

the middle of the incision corresponding with the point opposite the tip of the ninth costal cartilage. After exposing the gall-bladder in the abdominal wound, two circular purse-string sutures are placed in the peritoneal coat of the fundus of the gall-cyst, the first enclosing an area of about one-third inch in diameter, while the second suture encircles the first, being placed about one-third inch from it. While the viscus is steadied in the wound by the application of snap forceps, an incision is made across the area enclosed by the first suture placed, being careful not to cut the suture string; this accomplished, a rubber drainage tube of suitable size and length is introduced and the first purse-string suture tied snugly about it and the ends cut away. While making an effort to push the tube a little further into the gall-bladder, slightly inverting the margins of the organ, the second purse-string suture is tied about the tube, the ends of the suture afterwards cut close to the knot. After due inspection of the parts about the tube, the gall-bladder is made fast to the margins of the parietal peritoneum by four or more silk sutures passed through its serous and muscular coats only, after a portion of the upper and lower extremity of the abdominal incision has been closed with silk-wormgut sutures.

In eight or ten days, with no complications, the wound will be sufficiently healed to permit of the withdrawal of the tube without leakage, and in due time the fistulous opening will close completely without any lasting discomfort.

To avoid complications, strict antiseptic precautions should mark every step in the execution of the work and the patient advised to avoid excitement and exercise till well on the road to complete recovery.

CHOLECYSTECTOMY

Cholecystectomy is a term signifying the complete extirpation of the gall-bladder. The operation is demanded in rupture or other serious conditions of the organ, and is executed as follows: The gall-bladder is best exposed through the vertical incision opposite the cystic organ, along the line of the linea semilunaris. Before making any attempt to remove the gall-

bladder, the surgeon should carefully palpate the hepatic ducts, to ascertain whether or not they are patent; if in doubt, the operation should be delayed, or a choledochotomy substituted if a stone is found to exist in the common duct and it can not be crushed with the fingers or padded forceps, or pressed back into the gall-bladder or downward into the duodenum.

Should the gall-bladder be tied down by inflammatory adhesions, they should be broken up as the first step towards liberating the organ. The anterior margin of the liver is then forced upward with blunt retractors and the pylorus retracted downward out of the field of operation. If, upon palpation, the gall-bladder is found to be distended with fluid, it should be aspirated out before dividing the peritoneal covering of the cystic duct, exposing the latter, which should be divided between ligatures of silk. This done, the cystic artery resting immediately behind the duct, should be picked up and tied with silk; next divide the peritoneal covering of the gall-bladder, that binds it to the under surface of the liver, with scissofs and seize the gall-bladder with broad-beaked forceps and make steady traction while the cystic organ is separated from its attachment to the liver with blunt pointed scissors or the finger, and removed. Bleeding vessels should be picked up and ligated if possible, otherwise the hemorrhagic oozing should be checked with a temporary gauze packing, wet, if necessary, with adrenalin chloride solution.

Before closing the abdominal incision, the severed end of the cystic duct should be wiped dry and cauterized with pure phenic acid, the excess of which should be wiped away before dropping it back into the abdominal cavity. With conditions favorable, the abdominal wound should then be closed in the usual way, with no provisions being made for drainage.

If it is thought best to drain the wound in the liver, a twisted strand of sterile gauze should be enclosed in a layer of rubber tissue and the inner end placed near the severed end of the cystic duct. The medium should be removed the second or third day, if all goes well.

To lessen hemorrhage and the chances of infection, it will be well to approximate the margins of the peritoneal

covering of the gall-bladder that was incised, near its injunction with the liver and suture with catgut.

The external wound is dressed with sterile pads, which are held in place with a many-tailed bandage. This dressing will not need replacing for a week, if no unpleasant symptoms arise.

CHOLEDOCHOTOMY

This operation is executed to drain the passages above an obstruction in the bile-duct, and for the removal of a biliary calculus, that has become impacted at some point in the erectory passages. In order to facilitate the work on the ducts, a much longer incision should be made through or along the outer side of the rectus muscle, than is required in operations on the gall-bladder.

After dividing the soft structures down to the peritoneum, hemorrhage from divided vessels should be arrested before that membrane is incised, which is opened first in a small area between thumb forceps and then enlarged upon the fingers, which act as a guide, at the same time protecting the underlying organs from injury.

With the peritoneum opened and the anterior margin of the liver retracted, exposing the gall-bladder and the intestines walled back with thin sterile pads, the left hand is introduced into the wound and the fore-finger carefully introduced through the foramen of Winslow into the lesser peritoneal sac. With the finger beneath the ducts, and by pressing the thumb down upon them from above, their condition can be quite easily ascertained well down to their terminus. It will be well to examine the gall-bladder to determine its condition at the same time the ducts are examined. If it is found surrounded with inflammatory adhesions or contracted, the condition strongly suggests an impacted stone in the common duct. If an extended examination locates the obstruction, the duct should be brought into the open wound where it is steadied with the underlying finger, while the peritoneal covering is incised and reflected back, exposing the duct, which is opened over the calculus by a longitudinal incision and the stone turned out with

the finger or small scoop, using due care not to unnecessarily tear the tissues involved in the operative work. To be sure that other stones do not exist to obstruct the ducts, a small probe should be passed both ways in these tubes from the previously made opening to determine their patency. If conditions are found favorable, the incision in the duct should be closed with fine silk, using a fine half curved needle to place the suture. Before closing the abdominal incision it will be a safe measure to place a small wick or rubber drain in the wound with the internal end adjusted against the wound in the bile duct. To insure its remaining in place, the end may be secured to the margin of the wound in the tube with a suture of fine catgut. As a rule, the drain is removed the third day and not later than the fifth, unless serious complications supervene.

If for any reason the gall-bladder should require incision, it should be treated as directed in the article on cholecystostomy and the nature of the case will suggest. The abdominal incision should be closed with interrupted silk-wormgut sutures, extending through all the structures of the margins, except the peritoneum, which should be previously closed with catgut. The external dressings should be such as are generally made use of in abdominal operations.

DIVERTICULITIS

A diverticulum is a duplicature or offshoot of the structure composing the walls of several of the cavities and muscular tubes of the human system. There are two forms of the abnormal condition recognized in surgical work, the congenital variety, of which Meckel's diverticulum is a marked example, and the acquired form, resulting from disease or deficiency of the middle coat of the bowel structure, as may be noted in the pouch-like projections of the inner structure of the bowel through the separated muscular fibers, usually noted in some portion of the left colon.

It is when the tissues forming these offshoots are markedly loose and flabby, that the most trouble is experienced from their presence.

Meckel's diverticulum is observed as a single pouch-like process, located near the ileocæcal valve and is responsible for more trouble than when the morbid condition is situated elsewhere along the intestinal track. When this process becomes inflamed, the accompanying symptoms simulate those of acute appendicitis from which, it is, in most cases, impossible to exclude it. The process not infrequently resembles in appearance, the appendix, and its origin alone can only determine its true nature.

Diverticulitis occurring in the lower colon and rectum is generally due to chronic constipation and is observed in individuals of middle age, as a rule.

The symptoms accompanying the morbid state, vary in accordance with the location of the disease. If Meckel's diverticulum is attacked, tenderness and pain will be experienced in the right inguinal region, while these symptoms, with abdominal tenderness, will be noted on the left side, when the affection is located in the rectum anl lower colon.

Nausea and vomiting are present in most cases, while constipation and distention of the bowels with gas are marked characteristics of the trouble. Fever is usually present in advanced cases and the pulse is rapid and wiry, the tongue is coated with a yellow, pasty fur and the breath is fetid. If relief is not obtained early, the toxemia that is a serious feature of the disease, later often restults in collapse and death.

Treatment: Operative measures are the only means of relief, remedies even in potent doses can only be of temporary benefit. The patient should be prepared for a laparotomy in the usual way and the abdomen opened through a median incision. The appendix should first be inspected, if the internal disturbance has been felt on the right side; if that appendage is found in a healthy state, then a diverticulum should be suspected and sought for and if found, it should be removed in about the same manner as an appendectomy is done; usually the stump is inverted and the base closed with a purse-string suture.

If other morbid conditions are discovered, such as adhesions, malformations, or a necrotic state of the gut, they should be treated as the nature of the case will suggest. Cases of this nature, as well as suppurative peritonitis, will require provision

being made for drainage, when closing the abdominal wound, as a protective measure against the collection, within the peritoneal cavity, of purulent fluid.

The after treatment should be along the same lines as is followed in the treatment of appendectomy and operations of a similar nature performed on other abdominal organs.

When the abnormal condition occurs in the lower left colon, abscesses not infrequently form, as a result of suppurative inflammation; these should be treated by free drainage and a resection of a portion of the gut, if it is found to be the seat of numerous pouches or in a necrotic state. In most cases, this operation is accomplished in two stages, an artificial anus is first established and at a later period, after the inflammatory action and suppuration have subsided, the second step or the resection is executed. Free drainage, early established, will, as a rule, forestall further operative procedures.

During the progress of the morbid state, the patient's general health should be maintained with peptics, stimulants tonics and nourishing food. Echinacea, arsenic, iron, small doses of quinia and the lime salts should be given in alternation and the kidneys and bowels kept normal.

ENTEROTOMY

Enterotomy is a term used to signify the cutting into the intestines for the purpose of removing tumors and foreign bodies.

The patient is prepared in the usual manner and placed under a general anaesthetic. The abdomen is opened in the median line and that part of the intestine involved in the morbid process brought out and allowed to rest on hot sterile towels, if the operation is extensive, or merely into the wound while the abdominal cavity is protected by sterile gauze pads, if the operative procedure is trivial in character. If incisions only are to be made, they should be executed in a longitudinal direction and as far from the mesentery as the nature of the operation will permit. If the growth to be removed is of considerable

size, a section of the intestine, including the tumefaction, had better be removed; an enterectomy should be done.

The wound in the intestine should be closed with iron-dyed silk, with interrupted sutures, using Halsted or Lembert form of introduction.

The abdominal incision should be closed in the usual way, after which, sterile pads should be placed over the wound, following this with a firm binder some ten inches in width.

ENTERECTOMY

Enterectomy is the removal of a section of the intestine for relief of some existing morbid condition in the coats of the bowel in the form of tumefactions, ulcers, fistulas, strictures, gunshot wounds, and gangrene. Previous to operative proceedings, the patient should be prepared as for other abdominal
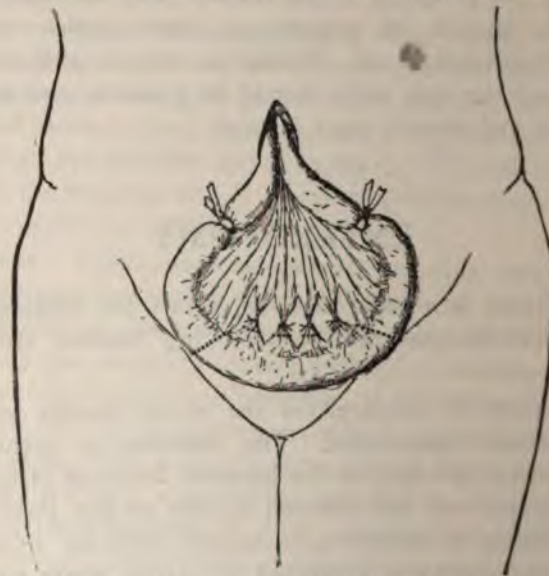
Fig. 150.—Enterectomy. A loop of the intestine has been drawn out through the abdominal incision, and tied off with tapes. The mesentery corresponding to the portion of gut that is to be excised has been tied off in sections. The dotted lines indicate the lines of section through the mesentery and gut. (*McGrath.*)

operations. After the patient has been placed under an anæs-thetic, the abdomen should be opened by the median incision. Af-ter locating the affected area it should be isolated from the rest of the bowel by placing a gauze ligature around the gut, a suit-able distance above and below the seat of the disease; to do this, the mesentery will have to be punctured near its connection with the intestine, with some blunt pointed instrument. In place of the ligature, clamps can be utilized to advantage.

The intestine, including the part to be removed, should be drawn out of the abdomen and protected with hot sterile towels; that portion of the bowel, including the morbid affection, should next be removed by a V-shaped incision, after which the opening in each end of the bowel should be cleared of its contents and then thoroughly cleansed with hot, normal saline solution.
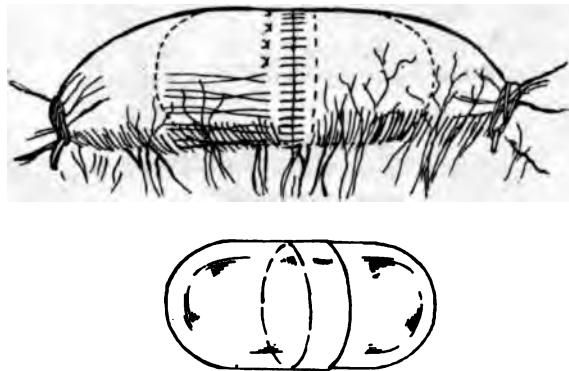
Fig. 151.—Intestinal anastomosis, uniting the ends of the severed intestine with iron-dyed silk, over a large gelatine capsule, which is later compressed and then left to dissolve.

The bleeding vessels in the mesentery are next picked up and ligated, following with a union of the divided ends of the intestine by the Murphy button or by silk sutures over a suitable sized veterinary gelatin capsule. After the union is completed, the capsule should be reduced to a flattened condition, by com-pressing the bowel between the thumb and finger.

Where the cæcum is the seat of disease, as well as other portions of the large intestine, unprovided with mesentery, the removal of sections of the gut is generally accomplished in two stages; the preliminary operation consists in uniting a portion of the bowel at a safe distance above the diseased area

to be removed to the bowel below by lateral anastomosis; with this operation properly executed and healed, the second step in the operative work should be undertaken, which should consist of excising the affected portion, afterwards closing the open ends of the gut by inverting the edges and closing the opening by a purse-string suture, reinforced by a row of Lembert sutures, taken in the serous and muscular coats only.

Fig. 152.—Lateral anastomosis of the intestines. The end of each section of gut has been closed by suture. The sections have been placed side by side, and joined by a continuous, non-penetrating suture. An opening has been made in each section of gut. (*McGrath.*)

Following this last step, the abdomen should be closed with silk-wormgut without drainage.

Every step in the operative procedure should be taken with a strict observance of antiseptic precaution to avoid, if possible, post-operative infection.

GASTROSTOMY

Gastrostomy is the creation of an artificial fistula in the walls of the stomach, extending to the external surface over

.the digestive organ. The operation is done to afford a means of administering nourishment in cases of malignant disease of the esophagus, or other morbid conditions of the muscular tube, as stricture or traumatism, that prevent taking food the natural way, in even fluid form.

The operation is executed under strict aseptic precautions, and under the influence of a general anæsthetic in nervous cases; otherwise the work should be done under local anæsthesia.

It is advisable in marked cases of stenosis of the esophageal tube to resort to rectal feeding for some little time preceding operative measures, to stimulate vital activity, that the patient may the better withstand the surgical work.

The instruments usually required to do the work are scalpels, blunt and sharp pointed bistouries, scissors, artery forceps and sponge holder, thumb forceps, needle holder, retractors, needles, straight and curved, catgut and iron-dyed silk for sutures, and besides plenty of gauze sponges and pads, absorbent cotton and gauze roller bandages.

There are several methods in vogue for executing the operative work, but the one should be chose that will best suit the case in hand, and that can be done the quickest. The technic of the work as commonly done is as follows: An incision some four inches in length is made either vertical or parallel to the costal arch, to the left of the median line, extending through the soft structures over the stomach. Through this incision the anterior part of the stomach is drawn out and made fast to the margins of the wound in the skin over edges of the peritoneum, which has been previously sutured to the skin with silk or fifteen-day catgut. The cardiac end of the viscus is usually selected in which to make the artificial opening. This may be done at once in urgent cases, or delayed until adhesions have taken place between the stomach and skin margins, some six days later, so as to the better protect the peritoneal cavity.

The opening in the stomach should be made with a sharp bistoury, and large enough to admit the end of a flexible rubber tube a half-inch or more in diameter, and some fifteen inches in length. The outer end should be sufficiently large to admit the end of a small funnel provided to feed the patient.

Care should be taken not to mistake the transverse colon for the stomach, when searching for the latter to bring it into the external wound of the abdominal walls. This is hardly likely to happen if the operator will bear in mind the relationship the stomach holds to the adjacent organs, its characteristic color, the omental attachment, and the size of the organ.

The rubber feeding tube is left in place, once it is inserted to the depth of two or three inches, except when it is necessary to remove it for cleansing or to substitute a new one for the old. After each feeding the tube should be cleansed the first week, and wrapped in sterile gauze, and secured to the body by a few turns of a bandage or by the under-garments.

Not infrequently the integument surrounding the fistulous opening becomes red, chafed and sore from moisture escaping from the stomach along the side of the tube. To relieve this condition the skin should be washed with the alkaline solution or lime water, after which vaseline or cold cream should be applied.

After the establishment of the fistulous opening the feeding tube should be removed from the stomach after each feeding, washed in borax or salt water, and then secured as before advised.

The external wound on either side of the opening in the stomach should be closed at the time of the operation by several silk-wormgut sutures, which should pass through all of the structures of the abdominal wall.

During the time that the wound is healing and the patient is becoming accustomed to the new method of taking nourishment, feeding by the rectum will have to be resorted to.

GASTRECTOMY

Gastrectomy has reference to the removal of a part of the stomach in cases where the organ is attacked with malignant disease. On account of the disease being far advanced before its nature is fully determined, and reluctance on the part of the patient to submit to operative procedures after being made ac-

quainted with the nature of the malady, few cases recover after the operation.

The nature of the operative technic is along similar lines as described in the operation for excision of the pylorus (pylorectomy), except where much of the stomach is removed the operation will be upon a larger scale.

A convenient portion of the jejunum or duodenum is united to the remaining portion of the stomach, after the opening is narrowed down sufficiently to meet the requirements in the individual case. This is done by closing the open end of the stomach with iron-dyed silk by a double row of sutures, and the union to the wall of the stomach by the same medium.

Strict aseptic measures should mark every step in the operative procedure, and the after treatment is by no means of minor importance.

Nourishment will have to be administered per rectum for a considerable time, and should be under the supervision of the surgeon.

GASTROTOMY

Gastrotomy means the cutting into the stomach for the removal of tumors and foreign bodies and for diagnostic purposes.

The patient is prepared as for laparotomy and placed under an anæsthetic. An incision four or five inches in length is made in the median line downward from a point an inch or two below the ensiform appendix. In dividing the soft structures all bleeding points are picked up and secured by ligature before opening the peritoneum. As soon as the latter is opened the presenting portion of the stomach is seized with forceps and drawn out of the abdominal incision and held firmly while it is surrounded with gauze pads wrung out of hot salt water to protect it, as well as the adjacent viscera from external violence. As a precaution against leaving any of the pads in the abdomen at the conclusion of the operation an artery-clamp should be snapped on one corner of each one used. The incision in the wall of the stomach should be no larger than is necessary to accomplish the object desired; if it be for the removal of a nail,

hair-pin or knife-blade a half inch incision will be of sufficient length, while an incision three inches in length may be required for the removal of a tumor or for diagnostic purposes. The opening in the stomach should be parallel with its long axes. After the object of the operation has been accomplished the incision in the viscus should be closed with a double row of sutures, the first being of fine chromicized catgut and placed near the margins of the wound, including all the coats except the mucous membrane; this row of sutures should be reinforced by another of iron-dyed silk which includes the serous coat only, using the Lembert form of suture or the Halstead if preferred. Before closing the external wound the suturing of the stomach incision should be carefully inspected for any faulty work; if found secure the external wound should then be closed with silk-worm-gut interrupted sutures each of which should include all of the structures of the abdominal wall unless there be much adipose tissue; in such cases the muscular and peritoneal layers should be closed with chromicized catgut and the skin and fascia with silk-wormgut. After cleaning the surface of the abdomen surrounding the wound, of blood and other fluids the sutures in the skin should be reinforced by two or three strips of zinc-oxide plaster applied between the sutures.

The after treatment will be the same as followed in laparotomies in general; complications receiving the necessary attention as they arise.

Nourishment is provided by rectal feeding for a day or two, after which a small quantity of meat broths or other light articles of diet may be taken at frequent intervals.

GLÉNARD'S DISEASE OF THE LIVER

Displacement of the liver downward, as a result of relaxation of the retaining ligaments of the hepatic organ, is occasionally met with in corpulent individuals and others given to excessive drinking of malt liquors and lax habit of body. To Prof. Glénard is given the credit of first giving a correct diagnosis of the morbid condition, and the causes leading up to it.

The symptoms accompanying displacement of the liver are pain and distress in the hepatic region, which becomes aggrava-

ted by being much of the time on the feet, and especially doing active manual labor. The function of the organ is markedly interfered with in pronounced cases, shown by digestive disturbances and the skin assuming a yellowish hue.

Treatment: By way of treatment, some relief has been obtained by adjusting a girdle around the body just below the ribs; but on account of its having to be laced tight to accomplish the end desired, the retaining medium is often worn with discomfort.

Efforts have been made to establish adhesions between the abdominal wall or diaphragm, by suturing the liver to these structures, but with only partial success. Shortening the suspensory ligaments of the organ has proven of greater benefit in cases where the operation has been feasible.

The patient is prepared for the operative work the same as for laparotomy. The after treatment requires the patient to rest quietly in bed for at least three weeks, and to refrain from active labor for some time after recovering from the operation.

HOUR-GLASS CONTRACTION OF THE STOMACH

A constriction of the walls of the stomach somewhere near the middle of the digestive organ is denominated **hour-glass contraction.** The morbid condition is generally due to an ulcerated state of the mucous membrane and muscular structure of the viscus, the serous coat also becoming involved if the ulcer is of the perforating variety. Cases are on record where the lumen of the stomach has been divided into more than two pouches by additional constricting bands. This distressing condition is seldom met with in childhood but is observed in individuals during middle life and old age, and especially in persons who have suffered keenly from digestive disturbances for years.

The symptoms generally observed in hour-glass contraction are pain and distress, which varies in intensity in accordance with the degree of contraction; nausea and vomiting some time after eating in most cases, and pronounced physical weakness in advanced cases, due to malnutrition.

Treatment: Owing to the character of the affection, a posi-

tive diagnosis is somewhat difficult to obtain in most cases. A
tumor in the region of the stomach may sometimes be outlined
in individuals thin in flesh, due to the hardness of the cicatricial
tissue at the site of the ulceration. A valuable aid to diagnosis,
is the attempt to dilate the stomach by forcing air into the
organ through a stomach tube with an air-bag fitted with a
rubber tube and nozzle to insert into the outer end of the
stomach tube. If the viscus fails to respond to the expanding
force of the air, it would be reasonable to presume that the
walls of the stomach were tied with bands of cicatricial tissue.
Instead of forcing air into the stomach in the manner above
described, effervescent agents may be administered in the at-
tempt to expand the organ; if this fails, the same conclusions
are justified as above described. For this purpose, solutions
of tartaric acid and bicarbonate of soda are taken separately or
instead, the ingredients of a seidlitz powder may be taken separ-
ately a minute or two apart; if expansion of the viscus takes
place in either case, increased resonance will be noted by pal-
pation over the gastric region.

In many cases of the morbid state, the symptoms are so
obscure that the true nature of the trouble is not revealed until
the stomach is exposed through an abdominal incision.

The hour-glass stomach is not amenable to treatment by rem-
edial measures; surgical operation gives the only promise of relief.
A gastro-gastrostomy should be done in every case where the
cicatricial bands of tissue are not extensive, otherwise a gastro-
enterostomy is the safer operation, and it is advised that both
pouches should be joined to the jejunum in pronounced cases of
cicatrical adhesions, other conditions not contraindicating the
procedure.

Following the operation, the patient should be kept at rest
in bed in a cool airy room. Nourishment is administered by the
rectum, according to the directions given under the head of
rectal feeding.

Thirst is allayed by holding bits of ice in the mouth at first
and sipping hot water later along in the progress of recovery.
The bowels should be kept open by enemas of sulphate of mag-
nesia in solution, or turpentine, glycerine and warm water, if
the bowels are much distended with flatus.

PART EIGHTEEN
Lesions of Bones and Joints

DISEASE OF THE VERTEBRÆ

The bodies of the vertebræ being organized structures, they are subject to inflammatory and other diseases that vary in degrees of severity.

One of the most common affections of the vertebræ is tubercular osteitis. It is essentially a disease of childhood, although it may occur in those of a strumous state of the body and the poorly nourished at any period of life.

Any of the vertebræ are subject to an attack of the devitalizing disease. It attacks the dorsal more frequently than the other regional vertebræ for two reasons only; there is more strain displayed upon them during exercise, and there are a greater number of them than in either the cervical or lumbar regions.

The exciting causes of Pott's disease of the vertebræ (for this is the acknowledged name for a tuberculous spine) are trauma, jars, prolonged pressure, and hereditary tubercular taint, a greater percentage of cases being credited to the latter.

The body of the vertebræ is the portion that is usually attacked, seldom if ever does the disease extend to the spinous or transverse processes. The articular surfaces usually escape the disease except when the atlas and axis are involved and then the attack is preceded by acute synovitis.

The symptoms will vary in accordance with the location of the disease and the severity of the attack, spasm of muscle and rigidity in some degree is a prominent diagnostic symptom in all cases. Tenderness and pain on motion are also characteristic symptoms of the affection, and when pronounced the patient carefully guards every movement to prevent strain or pressure of the diseased area. The attitude that the patiel

assumes whether sitting or standing, to relieve the weight of the upper part of the body is considered a diagnostic symptom of some importance.

As the disease advances, constitutional disturbances become manifest, by way of a rise of temperature in the afternoon, loss of appetite and a consequent loss of flesh.

The deformity will depend upon the amount of the destruction present in the vertebræ; if the necrotic condition be limited to a small area, and especially of the surface of the vertebræ sections, the deformity will be slight; but where one or more bodies have broken down, the spinous processes of the vertebræ primarily affected project backward to a marked degree, causing more or less of a deformity of the bone, giving rise to the name pigeon-breast; besides this abnormal state the sharp bending of the affected vertebral area often impinges upon the spinal cord producing partial or complete paralysis of the parts below the seat of injury. The latter symptom may manifest itself early in the disease or appear at a later period. Its onset is often noted as a muscular weakness which may, unless the diseased state is checked, pass into a condition of complete loss of power. When the upper dorsal and lumber vertebræ are attacked the muscles of the legs soon become flaccid and atrophied and the limbs are moved with more or less difficulty, and not infrequently the functions of the bladder and rectum are seriously crippled. The paralysis below the seat of disease is that of motion in the large majority of cases. Loss of sensation is not common, however a condition of anæsthesia of the nerves of the lower limbs is frequently noted in advanced cases. If appropriate treatment is commenced early in the course of tubercular spine, paralysis will be prevented in most cases.

Abscess at the seat of the diseased area is a complication not infrequently met with in advanced cases of tubercular spine. The morbid state is supposed to be due to bacterial invasion of the diseased vertebræ and to the inability of the feeble constitutional power of the patient to resist their destructive work. The collection of purulent matter may remain near the diseased vertebræ for an indefinite period or may gravitate along the sheath of some muscle having its origin near the seat of diseased bone, finally collecting at some distant point, when it

should be evacuated by incision. Not every case of necrosis of the vertebræ terminates in abscess formation, but to account for the immunity in one case, while in another with symptoms similar in character, conditions local or general soon give rise to profuse suppuration, is of course conjectural.

Seldom does the purulent matter arising from an abscess of the vertebræ find its way into the thorax or abdomen; this is, perhaps, due to the resistance of the dense fasciæ surrounding these cavities.

A collection of purulent matter about the last dorsal and any one or more of the lumbar vertebræ is known as psoas abscess, on account of the morbid condition taking place at the origin of the psoas muscle. The pus, gravitating along the line of least resistance, follows down the sheath of the psoas muscle terminating either at Poupart's ligament or near the termination of the muscles of the iliac fossa, and if it escapes over the crest of the ilium or through the sacro-sciatic foramen, it will point somewhere in the gluteal region. When found in the former region, the morbid condition will often simulate a hernia; a history of the case and a thorough examination of the patient will aid in determining the true nature of the morbid condition.

Abscesses of even moderate size occurring either in the lumbar or dorsal regions are quite readily outlined macroscopically and by palpation, and should be incised early to prevent the purulent fluid from burrowing into the surrounding tissues.

When the cervical vertebræ become diseased, resulting in abscess, the pent-up purulent fluid appears as a tumor at the side of the neck or burrows through the tissues and presents a tumefied mass back of the pharynx, which is also known as a retro-pharyngeal abscess. The presence of this tumefaction interferes with efforts of swallowing and to some extent that of respiration.

It is possible for the purulent fluid to permeate the intervening tissues between the abscess cavity and the thorax and abdominal cavity, discharging its contents therein, besides the pus may find its way into other hollow organs of the body; in such cases, the treatment will have to be along general surgical lines as each individual case will have to determine the course to be pursued. In these cases the characteristic symptoms are

all intensified. The temperature runs high; there is great thirst;
the patient is restless, does not sleep well, the appetite is poor,
and there is a rapid loss of flesh.

The general health may become so much improved through fol-
lowing proper medicinal and hygienic measures, that an abscess
once formed may become quiescent in its progress and later
incapsulated, presenting a morbid state, known as a cold ab-
scess.

The diagnosis of tubercular disease of the vertebræ is in
the main determined by the rigidity of the spine, spasm of the
muscles of the back, while attempting to lift the patient by
the feet while he is lying face downward; the altered gait and
attitudes assumed in sitting or walking about; the angular de-
formity of the spine in advanced cases; the muscular rigidity;
the twisting of the head and neck, causing various degrees of de-
formity in cervical tubercular disease; abscess formations follow-
ing the early characteristic symptoms of Pott's disease; tender-
ness and pain on pressure over the diseased area, and the various
degrees of paralysis, caused by the impinging of the cord, in
cases of marked backward curvature of the spine.

Treatment: The treatment, in the early stages of the dis-
ease, has for its object the relief of the local inflammatory con-
dition, tenderness and pain, and the improvement of the patient's
general health. The former is accomplished by administering
aconite or veratrum in combination with gelesmium or echin-
acea in doses sufficiently potent to meet the existing demands,
at the same time cooling and anodyne solutions should be top-
ically applied occasionally to hasten the cure.

The patient should assume the recumbent position upon a
hair mattress, to relieve the pressure caused by the weight of
that portion of the body above the diseased area, and cautioned
against moving about, or turning from side to side, to prevent
motion between the diseased vertebræ. In the case of small
children, it will be necessary to adopt some method of fixation
to prevent unnecessary moving about, whether they are con-
fined in bed or upon a frame, such as is represented in the ac-
companying cut. A soft pad or cushion is placed under the
projecting spinous processess to overcome the angular deform-
ity. Phelps and other surgeons of repute give preference to

the immobilization of the spine by applying a plaster-of-Paris cast, while the spine is held in a slightly over-corrected position. The plaster cast, when properly adjusted, rests upon the upper border of the pelvic bones and extends well up under the arms, so as to support the weight of that portion of the body situated above the affected area. In the treatment of caries of the cervical vertebræ, the jurymast, to hold the head backward and slightly extend it, so as to transmit the weight of the head

Fig. 153.—The making of a plaster-of-Paris portable bed, for the treatment of Pott's disease of the spine, in children under three years of age, whose hips are too small to support a plaster jacket. The plaster bed is made over a padded board; to strengthen it.

through the transverse and articular processes, is made fast to the posterior part of the plaster cast while it is being fashioned with rolls of plaster Paris. (See Cut.)

Young children, say under three years of age, cannot wear plaster-of-Paris to aid in the cure of diseased vertebræ; they do better when put up in a portable frame or bed made of plaster-of-Paris, over a padded wooden frame. The hips are too small to support a cast. When confined to this portable bed, the patient can be carried out of doors to get the necessary benefit of sun light and fresh air. Besides the jurymast utilized in the treatment of caries of the cervical vertebræ, various forms

Fig. 154.—Jurymast adjusted to a plaster-of-Paris jacket to be worn in Pott's disease of the cervical vertebræ, and so fashioned that the head is supported and drawn backwards, so as to transmit the weight through the transverse and articular processes.

Fig. 155.—Torticollis from cervical Pott's disease. (*Farnum.*)

of collars have been made use of to support the head and neck, some of which serve the purpose well. The leather collar, filled with some light material, as pine shavings or sawdust, recommended by Thomas of Liverpool, answers a good purpose in the early stage of the disease, as does a cast made of plaster-of-Paris or starch, which should be fashioned to rest well upon the shoulders and extended well up under the chin. This has a soft cloth lining and is cut down in front to prevent unnecessary pressure and when adjusted to the neck, it is held together by a piece of tape or bandage. It is very difficult, however, to secure the necessary immobilization of the diseased vertebræ with any form of collar, unless it can be securely fastened to some form of apparatus adjusted to the body.

The chief trouble that the surgeon has to overcome when treating spinal disease with mechanical appliances is the faulty after-care of the case by those in charge, especially if the patient be a young infant and fretful. Thinking that the apparatus is irritating or is causing pain, it is likely to be loosened, thereby allowing more freedom of motion which often prevents a cure.

Paralysis in grave cases of tuberculosis of the vertebræ is due to pressure by bending of the spinal column or to a deposit of caseous matter around the cord; when due to the former, the paralysis is quite sudden, but comes on gradually when due to the latter cause.

Operative measures give the only promise of relief where the paralysis is complete; if the conditions are not improved within a reasonable time by the use of mechanical appliances properly adjusted, abscess cavities are opened up, the necrotic osseous tissue is curetted out and drainage established. If a deposit of caseous material is encountered, it should be scooped out as in the previous case.

The operation is done by making a median incision, cutting off the tips of the vertebræ, leaving them attached to the spinal muscles, removing the spines, giving the operator ample room for the execution of the remainder of his work. The spinous processes with the attachment of muscles and ligaments strengthen the parts sufficiently to prevent fracture by anterior flexion. Strong bone cutting forceps and rongeur will be required to remove the osseous material. A plaster cast is applied

following the operative procedure, over the sterile gauze dressing. This is to be removed and another applied each time the wound is dressed.

Retropharyngeal abscess is opened with a curved bistoury wound to near the point with a strip of gauze to prevent cutting the tongue. The tongue can be depressed with the finger, while at the same time it may serve as a guide to the abscess formation. It is best that the patient's head be held face downward to prevent the liberated pus from entering the trachea. In the case of young children, it will be well to have plenty of gauze sponges at hand to clear the mouth of pus and blood which in some cases are present in large quantities.

The treatment of psoas abscess is described under the head of **abscess** in another part of this work, to which the reader is referred.

During the treatment of the local disease, the patient's health should be looked after in a general way. Patients suffering with caries of the spine have occasional rigors, followed by hectic fever; this state spoils the appetite and injures digestion. Peptics, tonics and stimulants, if prescribed for existing indications, will whip up a desire for food, and aid in its digestion and assimilation. Iron, sulphur, arsenic, pepsin and the lime salts will usually find a place here. The following formulas, taken on alternate days, will favorably impress an enfeebled body:

R.
    Fowler's Solution .... ℥ ss
    Syrup Lacto-phosphate of Lime and Soda .... ℥ iv
M. Sig.—A teaspoonful one hour after meals.

R.
    Phosphoric Acid (Dil.) .... ℥ iij
    Syrup Simplex, q. s. ....fl. ℥ iv
M. Sig.—A teaspoonful before meals, taken in a half wine-
      glassful of water.

Sulphur and some potent preparation of iron can be taken on alternate weeks with good effect. The functions of the kidneys and bowels should be looked after, and exercise or living much of the time in the open air advised.

TUBERCULOSIS OF BONE

Tubercular degeneration of the osseous structures of the body is frequently observed in individuals suffering with general tuberculosis.

The disease is likely to attack any part of the osseous system, the long bones more commonly than others. The periosteum and the epiphyses are the usual points of attack, although the miliary form of the affection generally commences in the marrow of the long bones, where the morbid deposit gradually accumulates, finally breaking down into pus, in some cases forming an abscess, the purulent fluid of which causes more or less inflammation and degeneration of the surrounding tissue, and in some instances a sequestrum of a considerable size is formed in the medullary portion of the shaft of the bone as a result of the morbid change. In cases where the primary point of attack is in the epiphyses and extends to and involves the joint, all of the symptoms usually accompanying the disease are intensified even to seriously crippling the use of the articulation.

The common symptoms usually experienced in tuberculous inflammation of bones are tenderness and deep pain in the part involved, accompanied with rigidity of muscles, a gradual enlargement of the osseous structure involved, and a limited loss of the use of the limb if the disease is located in any one of the extremities.

A tubercular infection of the upper lumbar and lower dorsal vertebræ gives rise to a destructive inflammatory state known as Pott's disease of the spine, while tuberculous dactylitis is the name given to the morbid affection when located in the bones of the fingers or toes.

As a rule the morbid action is slow unless a mixed infection takes place, in such cases the parts involved break down rapidly into pus-forming abscesses in the soft tissues surrounding the bone primarily affected.

Treatment: If a correct diagnosis of the morbid disease is made early, the patient should be put at once upon hygienic treatment, and such remedial agents applied locally and administered internally as the nature of any given case may require.

Iron, lime, and arsenic are indicated in anemic cases, alternated perhaps with dilute hydrochloric acid, nux, and the digestive ferments in digestive disturbances. It is during this stage that counter-irritation may relieve the deep-seated congestion and pain, but will avail but little good once the osseous tissue commences to be transformed into purulent matter. If the character of the disease permits, the patient should be advised to spend much of the time out-of-doors. Rich, nourishing food should be partaken of freely, and salt baths taken every two or three days.

Cases advanced to the stage of purulency require amputation or opening up the overlying soft parts and curetting away the necrotic tissue where the former procedure is not feasible. If an abscess forms in the soft parts as a result of the morbid deposit, it should be opened and thoroughly cleaned out with peroxide or other antiseptic solution and either swabbed out with pure carbolic acid or packed with iodoform gauze, or, in lieu of the above course, the abscess cavity may be filled with iodoform emulsion which may be allowed to remain twenty-four to thirty-six hours, when it should be removed and a sterile pad applied and held in place with several turns of a spiral bandage, when the affected part is located where such a course could be followed.

When the medullary portions of the large bones have broken down into pus, the fluid should be evacuated, together with other morbid matter, through apertures cut in the bone with mallet and chisel, aided by a bone drill, after which the cavity should be washed out with antiseptics and packed with iodoform gauze for a day of two.

ARTHRITIS

The term arthritis is applied to a general inflammation of the structures composing and surrounding a joint. The morbid state may be the result of one or more causes, viz.: rheumatism, gout, specific disease, gonorrhœa, tubercular affections, traumatism, and typhoid infection. The affection occurs as acute or chronic arthritis. Eruptive diseases and certain nervous affections frequently provoke the morbid condition.

Gonorrhœal arthritis is usually confined to one joint, the knee, ankle, and the elbow being the usual points of attack. However, the disease frequently attacks more than one articulation at or about the same time. When the joint becomes affected it usually occurs during the first month of the attack of urethritis, and is thought to be due to the presence of gonococci of Neisser. The morbid state rarely ends in suppuration, notwithstanding the fact the local state is usually due to active acute sero-fibrinous synovitis. Persons having this affection once are prone to future attacks if gonorrhœa is again contracted.

Arthritis following acute rheumatism is usually observed in adult life, and is generally polyarticular, nearly every prominent joint of the system being to some extent affected. In differentiating this form of the disease from the gonorrheal type, a correct diagnosis is often fraught with keen uncertainty, having only the history of the case to guide us, which is in many instances very misleading. The anatomic changes frequently observed in rheumatic arthritis are the formation of new connective tissue in the structures in and about the joint, and cacoplastic deposit resulting from acute inflammatory action. In many cases the inflammatory action absorbs the synovial fluid, contracts muscular and tendonous structures, which distorts the normal contour of the limb, and ankylosis of the joints frequently results. The first symptomatic indications of the onset of rheumatic arthritis are heat, sharp pain in the joints, especially at night; stiffening of the joints, which improves under massage and exercise; swelling about the joint, with redness, and usually attended with tenderness and crepitus on motion, caused by the grating of denuded bone. Position of the part being that of flexion and fixation, is observed in this form of the affection, but is not alone a feature of this form of the disease, it being a characteristic feature of arthritis resulting from any of the many causes.

Syphilitic arthritis is usually observed during the eruptive stage of the specific disease, athough arthritic complications are frequently met with during the late stages of the affection, resulting principally from gummatous deposits in the structures about the joint. Here, as in rheumatic arthritis, a correct diagnosis will depend largely upon the history of the case, together with, perhaps, microscopic examination of infected fluids.

Tubercular arthritis, or "white swelling," as some are pleased to term the morbid state, is frequently met with in the scrofulous and poorly nourished conditions of the body. It is a fact not easily disproven that chronic joint diseases are, in the main, tubercular, and that the tubercle bacillus is omnipresent in the vast majority of these cases. The disease is incident to childhood, and has for its inception, in the vast majority of cases, an injury to the joint by a fall, or other bruising force, followed by inflammatory action, with the usual cacoplastic deposit. The disease commences as an osteitis, and soon extends to the synovial membrane, and other contiguous structures. The cartilage is seldom the primary seat of the morbid state, but is destroyed later on through inflammatory action. Tubercular taint in the parentage has but little bearing on the case in review, for, as stated above, the majority of cases usually have a history of traumatism as a causative factor. In grave cases of the disease, where it commenced as an osteitis, gradually extending to the adjacent tissues, provoking a high grade of inflammation, resulting in necrosis of the bony structure, abscess formations often result, which sooner or later complicate the contiguous structures, producing what is termed peri-arthritis. About this time the patient will complain of rigors, followed by fever and headache, with an increase of local pain on motion and pressure. Only the prompt determination of the existing condition, and the thorough evacuation of the purulent fluids, will prevent rapid destruction of the joint structure. Should the morbid state manifest itself in the synovial membrane and adjacent tissues, as is frequently the case in the adult, the membrane becomes thickened with inflammatory deposits, and frequently covered with a spongy, granular mass, that will give a sense of fluctuation akin to that obtained by palpating an abscess formation. Indeed, this spongy state of the tissues about the joint is so marked in some cases that operative measures have been resorted to with the expectation of evacuating pent-up fluids. These fungus growths often break down under cheesy degeneration in the adult, forming abscesses which prove destructive to the joint, unless the morbid state receives surgical attention early.

Arthritis often results from neuropathic causes, notably hysteria, and locomotor ataxia. In some phases of the disease the

course resembles that observed following an attack of rheumatism. The swelling about the joint usually takes place suddenly, is not attended with marked symptoms, such as heat, pain and tenderness; the increased swelling of the joint structure being the special feature in the case. The synovial membrane is usually the primary point of attack. However, the devitalizing state soon passes to other contiguous structures. The ankle and knee joints are perhaps the most frequently attacked, but other joints may be severely crippled by the devitalizing forces at work. Fracture and dislocation have been known to take place as a result of structural degeneration of the joint.

In cases complicating locomotor ataxia the local disturbance is usually manifested following the lesion of the spinal cord.

Treatment. The treatment of arthritis will require both medical and surgical measures. The medicinal treatment, in the large majority of cases, will embrace both local and general means to meet the many phases present in grave attacks. As a general treatment that will be applicable to most cases may be mentioned enforced rest, position, extension, and in some cases elevation. Then constitutional measures of importance will be proper diet, suitable clothing, exercise, and the indicated remedies for the individual case under treatment. It is conceded by high authority that rheumatism and rheumatic arthritis. are mainly due, or influenced, by malnutrition, and that the patient afflicted with the disease should be given a generous diet of good wholesome, nutritious food, well cooked, and served to meet the requirements of the individual case. If meat is relished, the patient should not be deprived of it. It must be cooked properly and thoroughly digested. The same advice will hold good with regard to other articles of diet, care being taken, however, not to give to excess any one variety of food. If it is observed that acids disagree with digestion, less should be used; and if sugar and starchy articles of diet provoke intestinal disturbance, they had better be discontinued. As digestion and assimilation of food are of the first importance, the diet should be a special feature of the treatment.

As sudden changes of temperature always unpleasantly affect those of a rheumatic tendency, they should be clothed in garments that will guard against the chilling of the body, and

to prevent a too rapid evaporation of perspiration. Garments made from woolen texture will answer well in some cases, while in others a mixed texture of wool and cotton will give better results.

Special attention must be given to the functions of the skin, kidneys and bowels, that their eliminative powers be kept highly active. An alkaline bath can be taken daily to an advantage, especially should there be some rise of temperature during the day. The bowels should be kept open with the saline laxatives, which generally stimulate a slight diuretic effect on the kidneys.

When the patient's condition will permit, and the weather conditions are favorable, exercise in the open air will promote a better circulation of blood, and a free perspiration, which will prove beneficial in the large majority of cases.

Enforced rest will prove of much benefit during the stage of heat, pain, and congestion or irritation about the joint. If motion greatly increases the tenderness during the inflammatory stage, it may be well to encase the joint for a time in a plaster-of-Paris cast, which should be removed as soon as the acute stage has passed, to prevent ankylosis. To restore normal action to the joint, massage and enforced motion to a limited degree will avail much.

Topical applications to the joint of cooling lotions during the inflammatory stage, and stimulating liniments in chronic cases, with massage and gentle friction, will prove of decided benefit. As a cooling lotion, the following mixture will meet the requirements in most cases:

℞.
Muriate Ammonia .... ℨ iij
Tinct. Conium Mac. .... ℥ j
Aqua dest .... ℥ xvj
M. Sig.—Sop on the affected joint every half to one hour during the acute inflammatory stage. Benefit is obtained by evaporation.

A stimulating lotion, useful in tender, subacute and chronic cases, is prepared as follows:

℞.
Spirits of Turpentine .... ℥ ij
Camphorated Oil .... fl, ℥ iv
M. Sig.—Bathe the joints, with brisk friction, every three or four hours.

Much benefit is derived in these cases by wrapping the joints in several layers of flannel, and subject the parts affected to dry heat in an oven, properly constructed for this purpose. Great heat can be endured by this method of application, but it is of doubtful utility in the acute stage of the attack. The heat may be carried to a point of 250 to 300 degrees F., by properly protecting the joint with cloths to prevent irritation.

The medicinal treatment will have to be varied to suit the individual case applying for relief. During the acute stage, if the tongue shows deep redness, with a high range of temperature, an occasional dose of dilute hydrochloric acid, well diluted with water, will prove of benefit, taken in connection with the folowing mixture:

℞.
    Spec. Tr. Veratrum Vir. .... gtt. xv
    Spec. Tr. Bryonia .... gtt. x
    Aqua Menthæ Piperita ....fl, ℥ iv
  M. Sig.—A teaspoonful every hour.

In the subacute and chronic stages of the disease, substitute colchicum for the bryonia. If the patient is restless and irritable, gelsemium in potent doses will find a place, taken singly or in connection with macrotys if there be present marked muscular soreness and frontal headache. If the tongue shows a pallid, dirty coating, an alkaline agent is indicated, the most potent of which is sulphite of soda and the effervescent Alkalithia, an alkaline compound put up by Keasby & Mattison, which will prove of great benefit, especially should the fluids of the system show decidedly acid, and the urinary secretion prove scanty. Apocynum should not be overlooked in cases showing œdema about the tissues of the joint.

In cases due to gonorrhœal infection, besides the general treatment advised in other forms of the morbid state, which will be of great benefit, special stress should be directed to the importance of placing the part at rest, and applying a plaster cast, if effusion has not taken place. In cases where the effusion is present in large quantities, either immobilize the joint with a suitable wire splint, and make application of cold in the form of the ice-bag, or draw off the inflammatory fluid by aspiration, and flush out the cavity with Thiersch's solution, or a one per

cent solution of protargol. If this flushing is done thoroughly, much benefit will soon be observed. Following the flushing of the cavity, the joint should be placed in a plaster cast until the tenderness has well subsided, when massage and passive motion should conclude the treatment. Care must be taken to evacuate the sero-purulent or purulent fluid at once after its presence is determined, to prevent serious destruction to the structures of the joint. To prevent ankylosis in grave cases, no better treatment can be followed than massage, passive and active motion, in the absence of inflammation.

Arthritis due to syphilitic taint will be best treated by paying strict attention to the dietary of the patient, together with such tonic and stimulating medical agents as will whip up an appetite and improve digestion. An excellent systemic tonic in extreme weakness is the following: Fowler's solution one drachm; the elixir of glycero-phosphate of lime and soda, six ounces; a small tablespoonful after meals, in a wine glassful of water. If the tongue shows a leaden hue, or if it presents a dark red color, the acid solution of iron, in two- or three-drop doses, after meals, taken in a little water, will act kindly, as will potent doses of iodide of potassium three times a day, taken in solution with tincture of gentian. In this form of the disease, as well as in the other varieties, the emunctories of the system must be kept in a normal condition. The local treatment will not differ from that followed in other forms of the morbid state.

Tubercular arthritis, so frequently met with among the poorly nourished, usually improves under a hygienic and tonic course of treatment. Peptics, tonics and stimulants whip up an appetite and improve digestion. The food should consist of well cooked meats, pickled pigs feet, eggs, custards, olive oil on salads and other suitable food, rich cream and fresh milk, graham and whole wheat bread.

Topical applications, such as equal parts of turpentine and camphorated oil, clove oil one part to alcohol three parts, chloroform liniment, and hot salt bags, and hot water bags, will be comforting by assuaging pain in most cases. In marked inflammatory states, a rubber bag filled with cracked ice, and a to the joint with a layer or two of flannel adjusted betwe

skin and the bag, to prevent a too profound effect, will prove highly beneficial.

Traction and fixation will benefit some cases of tubercular arthritis, by overcoming spasm of muscles, thereby relieving pressure pain. The course seems best suited to sub-acute cases. It is the writer's experience that suitable traction benefits more cases than that of fixation by splints or the plaster cast. There is not much likelihood of ankylosis resulting from enforced rest by fixation. If it occurs it will likely be due to continued inflammatory action. As long as there is evidence of irritation about the joint, which will be indicated by tenderness and spasm of muscle, the cast or the extension apparatus should be worn, if the time be three months or six months.

In grave cases, giving evidence of great quantities of tubercular deposit in and about the joint, especially should there be destruction of tissue, resulting in abscesses, much benefit has resulted from the injection into the joint tissues of a ten per cent emulsion of iodoform in glycerine. If no benefit is derived from the injection of the emulsion within a reasonable time, resort will be necessary to operative measures, such as laying open the tissues about the joint, curetting away all necrotic tissue, making extension, and treating the injured joint as we would a fresh wound. Abscess formations must be evacuated through a small incision, the cavity thoroughly cleansed with a one to three thousand bichloride solution, followed by the iodoform emulsion, an ounce or more being used, being governed, of course, by the extent of the cavity to be treated.

In place of the iodoform emulsion, bismuth paste is preferred by surgeons who have given it an extended trial. The mixture is prepared by thoroughly mixing three drachms of subnitrate of bismuth in two ounces of liquid petrolatum or melted vaseline. In grave cases, where the above treatment proves ineffectual, excision of the joint will be the next step, which will be followed, of course, by ankylosis, or amputation of the limb, where all forms of treatment fail to stay the progress of the disease, and the patient's life is endangered.

SYMPHYSIOTOMY

A division of the symphysis pubis to facilitate labor is sometimes resorted to where the diameters of the pelvic outlet are abnormally small. It is claimed that the operation was done as early as 1773 by a medical student by the name of Sigault, who afterwards was awarded a medal for originating the operative idea.

The operation is quite easy of execution, and under strict aseptic precautions not much danger to the patient attends the work.

To execute the operation the surgeon will require scalpels, scissors, hemostats, retractors, dissecting forceps, catheter and Gigli wire saw.

The patient is prepared for the operation in the usual manner and placed under the influence of a general anæsthetic, chloroform being preferred. With the patient resting in the dorsal position, a median incision two and a half inches or more in length is made over the symphysis extending to the bone. If the patient has not been previously catheterized, it should be done before an attempt is made to pass the wire saw around the bone. After the skin, fat and fascia have been severed, the lower part of the rectus muscle is separated with the finger or handle of the scalpel, care being taken not to wound the prevesicle structures and, to prevent this, a catheter or sound should be passed into the urethra and through this medium the tissues can be held out of the way while the wire saw is passed around the pubic bone, and made to separate it at the symphysis, or, in the absence of a saw, the separation may be accomplished with a heavy cartilage-knife. The pubes may then be separated to the extent of two and a half to three inches, and the delivery of the child accomplished naturally or by the aid of forceps. After the delivery of the child, the traumatic surfaces of the pubic bones are adjusted and wired, the wound in the overlying structures closed with catgut sutures and sterile dressings applied, over all and around the hips and pelvis a stout binder is snugly adjusted and worn for a month or more.

TENOSYNOVITIS

Inflammation of a tendon and its sheath frequently results from an injury, especially if the wound becomes infected; gout and rheumatism, syphilis, and gonorrhea are also exciting causes. The chronic form is recognized in tubercular constitutions. The wrist and forearm are frequently the seat of the acute form of the morbid state when it is produced by a strain or over-use.

The stage of inflammation often results in exudation, which eventuates frequently in suppuration. Especially is this likely to be the termination of a severe attack when the deeper structures are affected.

Pain, redness, swelling, and tenderness along the course of the tendon with crepitation, are symptoms of the acute form of the affection with chills, followed by fever in those cases that go on to suppuration. In the chronic variety the symptoms of active inflammation are absent, a weakness of the part is noted and this phase of the disease is usually associated with gouty and tubercular affections of the joints.

Treatment: In the treatment of this affection, topical application of anodyne and cooling lotions will be of some benefit to the patient by way of relief from inflammatory conditions, but the applications will not bring the relief that will result from immobilizing the part with light wooden splints, or by the application of a light plaster cast; this done and the part placed at rest, the morbid phases of the affection soon disappear. Strapping the affected part with inch strips of oxide of zinc plaster gives excellent results, care being taken not to apply the dressing so tightly that the circulation is interfered with. Should suppuration ensue, the fluid should be evacuated by aspiration, or incision with drainage. Infected abscess cavities should be injected with iodoform emulsion and kept at rest.

SPRAIN

The violent straining of one or more ligaments by direct or indirect force, with a partial and temporary displacement of the articulation, is called a sprain. It is a common injury to the

ankle, wrist, and elbow joint. A turn of the foot while walking or alighting upon the foot in falling from a height, frequently produces a sprain to the tendinous structures about the ankle joint, and often lacerating the capsular ligament, allowing the escape of the synovial fluid into the surrounding tissues which, with a limited amount of hemorrhage, provokes more or less inflammation of the injured tissues, which often eventuates in abscess formations if prompt surgical measures are not resorted to early.

The symptoms of a sprain are not unlike those of a fracture, and it requires careful examination in some cases to determine that only a sprain has been received. Acute pain, followed by puffiness or swelling of the tissues about the articulation, with more or less disuse of the joint, are marked symptoms of a sprain. If the capsular or other ligaments have been lacerated, causing some hemorrhage, ecchymosis of the subcutaneous tissue will appear within three to five days. If the sprain be moderate, improvement will become manifest in ten days to two weeks, otherwise the disability will drift into what is known as a "chronic sprain."

Fig. 156.—Treating sprained ankle with strips of adhesive plaster. The cut shows the first strips applied.

Fig. 157.—The method of applying the second lot of strips.

Sprains are infrequent in children, but are commonly met with among the laboring classes.

Treatment: The treatment of a sprain depends in a great measure on the severity of the case applying for relief. If moderate in character, with no indication of laceration of tissues, and the case is seen before much swelling has taken place, the proper strapping of the joint with adhesive plaster to give support and elevating the part, enjoining rest for ten days or two weeks, followed by massage and douches of salt water several times a day will be found efficient in the majority of cases. Where the tissues have been badly lacerated, attended with pain, tenderness, and swelling, the joint should be encased in a plaster cast to give support and placed at rest in an elevated position. As the swelling subsides, which it will in a few days, the cast should be removed and another adjusted. As soon as the swelling subsides and the tenderness will permit of it, the injured part should be gently massaged, douched with cold water, and

moderate motion applied. Various methods have been adopted for the relief of sprained muscles and tendons other than has been mentioned, with varying degrees of success. Extension of the part with the topical application of some potent cooling lotion, till the inflammatory action has subsided, followed by massage and gentle movements; wrapping the joint with two or three layers of flannel and subjecting it to two or three hundred degrees of heat in a properly constructed oven, followed by massage, repeated several times a day, immediately following the injury. This last course is somewhat severe and should not be put to use except in severe cases. Should suppuration follow the injury, the seropurulent fluid should be evacuated and the cavity flushed out with Thiersch's solution or a one to three thousand bichloride wash, and the part supported with a flannel bandage snugly adjusted.

SYNOVITIS

Inflammation of synovial membranes is termed synovitis, and may result from several causes, chief among which are injuries to the joint. Exposure to wet and cold and the infectious and severe constitutional diseases are also exciting causes of the morbid state.

The inflammatory state is divided into the acute and chronic form, the latter in the great majority of cases being of a tubercular nature, and not infrequently eventuating in abscess formations. Where the disease extends to the deeper structures of the joint, or the bone itself, the morbid state is spoken of as arthritis or osteitis. A differential diagnosis is difficult to make in some forms of joint disease. The acute form of synovitis usually terminates in resolution, the chronic form in suppuration. The symptoms of acute synovitis are heat, pain, and swelling with limit of motion, with the pain increased on pressure and worse at night. Should the disease attack the hip joint the pain is frequently complained of in or about the knee. Should the temperature rise much above 101°, assuming a hectic character, suppuration should be suspected. Fluctuation may be elicited in some cases during the early stage of the morbid state,

which becomes less evident later along in the course of the affection, on account of the changes taking place in the inflammatory fluid.

Treatment: The treatment of the acute form of synovitis consists of cooling lotions, or the application of the ice bag in cases where the inflammatory action is pronounced, followed by bandaging, or, what is better, strapping the joint when feasible, with strips of adhesive plaster, and keeping the part at rest. Keeping the part elevated, when possible, contributes materially to the comfort of the patient, in painful states. In obstinate cases the well-adjusted plaster-of-Paris bandage gives excellent satisfaction. When the collection of fluid in the joint is considerable, it should be drawn off with a trocar or aspirator and a bandage snugly adjusted. Washing out the cavity is seldom resorted to, excepting the joint structures be tubercular. In cases of this nature, much benefit follows flushing out the cavity with a warm solution of iodoform, one drachm, glycerine four drachms, warm sterile water, six to eight ounces. In cases where pain is a marked feature, moderate extension often brings relief.

The treatment of chronic cases will be along the line of that suggested for acute cases, with the addition of massage in cases showing marked contraction of muscular and tendinous tissue, hot-air baking in lame and painful states of the joint, and in some stages of the disease the application of some form of counter-irritation or the iodine ointment.

Attention must be given to the general state of the system during the invasion of the local disease; if there is present a scrofulous taint, iron, arsenic, and other potent systemic alteratives and tonics are demanded in connection with good food and living a life out of doors when possible.

Free drainage must be provided for in suppurative synovitis by extending an incision down through the tissues into the joint above and below and on either side, and suitable drainage tubes introduced which should be kept in place until the discharges have ceased. Every care must be taken to evacuate every pocket of pus, otherwise hectic flushes of heat and high temperature will continue. Decided benefit will be derived from

thoroughly irrigating the suppurating cavity once a day with quite warm sterile saline solution, made by adding a teaspoon- ful of salt to the pint of boiling water. Ankylosis results from inflammatory action, and efforts to restore the joint to a normal state by passive motion must be deferred until the inflammation is subdued.

RACHITIS—RICKETS

Rickets is the term applied to an abnormal state of the bones which is characterized by a deficiency of earthy salts, stunted growth, enlarged extremities and deformity. The morbid state is

Fig. 158.—Terminal enlargement of radius and ulna in rickets. (*Farnum.*)

essentially a disease of early life, and may be said to result from faulty diet, mal-nutrition, and bad hygienic surroundings. One characteristic of the long bones is the enlargement of the epiphy- seal cartilages especially observed at the wrist, and ankles, with an abnormal thickening of the periosteum covering the bones.

The early phases of the morbid state are restlessness, ex- treme perspiration, especially about the head and neck, delayed dentition, a prominent abdomen, and the voidance of an abund-

ance of urine usually containing large quantities of phosphates. Naturally there would be a marked anæmic condition present as the result of these systemic disturbances.

If the abnormal state is not checked early in its course, serious deformities soon mark the progress of the disease. The legs and arms become distorted, as well as the spine, and the breast bone often protrudes, giving rise to a form termed "pigeon breast." This latter deformity may be of so grave a nature as to give rise to a chronic inflammatory state of the lungs and bronchi. A peculiar feature noted in connection with the pigeon-breasted chest is the prominence of the epiphyseal ends of the ribs where they join the breast bone; this noted feature is likened to a string of beads, and is spoken of as the "rachitic rosary, or garland."

General debility is a complication of nearly all cases of rachitis, and the distortions of the chest walls often provoke grave diseases of the chest and abdomen. Hydrocephalus is frequently observed in rachitic cases.

The prognosis is favorable, so far as the morbid state itself is concerned, but death frequently results as a consequence of the complications.

Treatment: As remarked before, this morbid condition is the result of a faulty diet and bad hygiene; this being the case, a rational treatment will at once suggest itself. First the diet should be properly selected and prepared. If the child is nursing, the general health of the mother should be investigated; if the improving of her condition does not reflect an improvement upon the child, it should be taken from the breast and put on some of the approved cereal foods, which should be carefully prepared and given in connection with freshly made beef-juice, obtained by squeezing a partially cooked piece of lean beef in a strong lemon-squeezer.

If the child be under six months of age and does not thrive on the mother's milk, a healthy wet-nurse should be substituted; should one not be obtainable, milk from a fresh, healthy cow can be prepared by diluting one half with weak lime-water. The child should be given the stimulus to be derived from living much of the time in the sunshine and fresh air.

The child should be kept in the recumbent position as long as the bones are soft and liable to become distorted by bearing any weight. The body can be rubbed with the following unguent morning and evening with great advantage.

R.
Flowers of sulphur ....ℨ ij.
Sulphate of quinine ....ℨ j.
Oil of sassafras ....ℨ j.
Cocoa nut oil ....ℨ iv.
M. Sig.—External unguent.

In connection with the proper diet and application of the unguent, give internally in small doses any one of the following remedial agents; sulphide of calcium, specific tr. of phosphorus, phosphate of lime, carbonate of lime, and albuminate of iron as may be symptomatically indicated.

FRACTURES

The separation of a bone into two or more pieces as a result of direct or indirect force applied to the organized structure is termed a fracture. Owing to the exposure, shape, and size of the different bones of the body, some are more liable to fracture than others. Severe constitutional diseases, morbid states of the bones, and old age, often render the bones fragile, and they will break from the display of slight violence. In early life the number of fractures occurring between the sexes are about the same; in the middle adult life more fractures occur in men than in women, owing no doubt to the hazardous occupations of the former; in old age the increase in percentage is in favor of women. On account of the increased brittleness of the bones in later life, a greater percentage of fractures occur after the age of sixty than before, notwithstanding the increased exposures that people are subjected to in middle life.

Fractures are classified into simple and compound; complete and incomplete; multiple or comminuted, and gunshot. A simple fracture is one in which the continuity of the soft structures surrounding the bone is left intact. A compound fracture is one accompanied by a wound extending from the fracture through all the overlying tissues to the external surface. The

complete fracture is one where the break involves the entire thickness of bone; while the incomplete or green-stick tracture has for its special feature a break involving only a portion of the entire bone, the remainder being bent at or near the seat of the partial break. When a bone is broken into several parts, some of which are completely separated from connection with the body of the structure or the periosteum, the fracture is said to be comminuted. Two or more fractures occurring in the same bone, the lines of breakage not communicating, are termed multiple fracture. A gunshot fracture is one which is produced by shot, shell, bullet or other flying missile propelled by the explosive force of gunpowder. A fracture is said to be impacted when one fragment is firmly driven into another. A complicated fracture is one having as special features the additional injury to important nerves, blood vessels, and joints; also extensive wounds of the soft parts.

Fractures are spoken of as oblique and transverse; the terms indicating the course or direction the break extends when fractured. The former is generally produced by indirect force, while the latter is more often the result of direct violence. Fractures having as a feature, lines radiating from the central point of injury, are termed stellate; and when the broken surfaces are markedly jagged, or serrated, the fracture is called dentate.

In uncomplicated fracture occurring in the young and middle aged, the fragments usually unite firmly in six weeks to two months; a much longer time is required for the consolidation of fractures complicated with severe injuries to the soft parts and to joints.

The symptoms common to fracture of the bones are divided into two classes; the objective, or those that can be seen by the surgeon, and the subjective, or those symptoms that depend upon the senses of the patient to feel and describe. To the former belong such signs as deformity and abnormal mobility at the point of fracture. To the latter class is ascribed pain, crepitus, loss of function, and a description of the case.

The necessary apparatus required in the treatment of fractures will be mentioned in connection with the treatment of special fractures of the bones taken up in regular order.

FRACTURE OF THE VERTEBRÆ

Fracture of the vertebræ is frequently met with, and is usually a complicated and serious injury. When a vertebra is fractured, not only is the support of the head, neck, and that portion of the trunk above the injury weakened, but serious damage is often done the spinal cord or nerves from shock or impinging the same between the fragments of bone. Owing to interlocking of the spines and processes of the bodies of the vertebral column, excepting in the cervical region, a dislocation of a vetebra does not often occur without fracturing one or more of these bony attachments.

From recorded cases it is noted that the fifth and sixth cervical, and the last dorsal vertebræ are more frequently fractured than any of the others.

As the symptoms of fracture and dislocation of the vertebræ do not differ in a marked degree, it is often very difficult to differentiate between the two injuries. It has been determined that the bodies of the vertebræ are more frequently fractured than the processes; and that the common causes of the injury are falls upon the head, violence displayed upon the head as from bodies falling from a height, direct violence received from kicks and blows, and from muscular action.

The symptoms in common, regardless of what portion of the vertebral column is involved, are shock, localized pain which is increased by motion, more or less deformity, which may be accompanied by swelling of the adjacent soft parts, and sometimes crepitus can be elicited. The special symptoms that follow a fracture of the vertebræ are paralysis of that portion of the body, and the limbs extending below the fracture, and more or less impairment of the function of the bladder and rectum, indicated by retention or incontinence of one or both of these organs. If the fracture occurs in the cervical region, respiration is crippled to a greater or less extent, and the systemic vitality is markedly depressed. Paralysis may be due to hemorrhage within the canal, caused by direct violence, and not to fracture or dislocation, as has been determined by postmortem examination. Complete paralysis immediately following a fractured injury

indicates either a division of the cord or impinging of the same by the fragments or displaced bodies of the vertebræ; while a gradual extension of the paralysis, if not due to hemorrhage, is likely to result from traumatic inflammation of the cord. The higher up the fractured injury takes place the greater the mortality. Bed-sores or sloughing of tissue often follows points of pressure, and priapism is noted in about thirty per cent of fractures above the lumbar vertebræ. Death is almost sure to result from fracture of the atlas or axis, and in far the most cases follows the accident immediately; however, persons suffering from paralysis following fracture of the vertebræ in the dorsal and lumbar regions have lived for twenty to thirty years.

Treatment. A person suffering from fracture of the vertebræ should be placed on a hair mattress and kept as quiet as possible. To avoid inflicting severe pain, and to prevent further injury to the cord, the patient should be placed upon an improvised stretcher in a horizontal position for transportation. If symptoms of compression, and the deformity, are relieved after the patient assumes the horizontal posture, relief and a possible recovery may result by supporting the spinal column by apply-

Fig. 159.—A portable plaster-of-Paris bed, useful in the treatment of fracture of the legs and spine in young children. The cast is made over a padded board, to give support to the apparatus.

ing a plaster-of-Paris cast or corset to the thorax or body extending well above and below the seat of injury. Cases presenting marked symptoms of compression of the cord will demand careful extension and counter-extension of the trunk while pressure forward is made upon the projecting angle, if one exists. If this procedure does not bring any degree of relief, the fractured part should be cut down upon and the displacement adjusted, if possible, followed by the application of the plaster jacket, to strengthen the fractured part. Unnecessary movements of the head and body may be limited by placing sandbags along either side of the body, and irritation of the skin over prominent parts prevented by frequent application of alcohol and witchhazel. In cases of complete paralysis the patient should be placed on a water-bed or soft hair mattress to prevent bed-sores, giving prompt attention to the function of the bladder and bowels. In most cases it will be necessary to catheterize the patient three or four times a day.

The prognosis in fracture of the vertebræ should be guarded. If sensation and slight motion return within a few days following the injury, some hope for, at least, partial recovery may be entertained.

FRACTURE OF THE PELVIS

The common causes of fracture of the pelvic bones are kicks, falls, and crushing forces received by the passage of the wheels of a heavy laden vehicle, or moving bodies. Fractures of the pelvic bones, without displacement, are not always fraught with serious after-effects; however, in cases with displacement, fragments of bone are frequently driven into the pelvic organs, severely lacerating them and crippling their functional activity. The pubic arch is perhaps more frequently broken than any other portion of the bony ring, because of its greater exposure. Alighting upon the feet when falling from a height often produces fracture of the acetabulum, the impact often driving the head of the femur entirely through the cotyloid cavity. Separation of the symphysis pubis often occurs during

the throes of labor, and direct external violence; while separation of the sacro-iliac articulation is nearly always due to the descent of the fœtal head through the pelvic outlet during the throes of labor.

The symptoms denoting fracture of the bones of the pelvis are pain, which is increased by motion, crepitus obtained by pressure, inability to use the limbs in efforts to walk, displacement in some cases, and more or less shock. The voiding of bloody urine, rupture of the bladder and laceration of the urethra followed by extravasation, sepsis, and perhaps peritonitis, are frequent complications of fractured injuries of the pelvic bones.

Treatment: In cases of fracture of the pelvic bones without displacement, the patient should be placed on his back upon a smooth mattress, the pelvis being supported by a wide bandage snugly pinned about it. Where displacements are clearly outlined, reduction should be attempted by manipulation, and traction upon the leg in case the acetabulum is broken through.

To relieve the muscular tension about the pelvis, the legs should be moderately flexed and supported by pillows or sandbags. The long splint extending from the axilla to the foot, to which the lower end of the splint is fastened, is essential in treating severe fractures of the acetabulum with protrusion of the head of the femur. As soon as indications point to a laceration of the urethra, an attempt should be made to introduce a medium-sized catheter, and should its introduction be prevented by the local injury, an incision should be made through the overlying structures, using the distal end of the catheter or sound as a guide to the lacerated portion. Under local anæsthesia, the severed ends of the urethra are to be picked up and united around the sound by silk sutures. If the catheter can be introduced into the bladder, determining the presence of bloody urine, it should be left in place for a reasonable time to prevent extravasation, if possible. In cases where the bladder has suffered rupture, suprapubic cystotomy is usually resorted to to evacuate the extravasated fluids and to mend the bladder rent if possible, or to establish drainage. Grave cases of bladder complications have made it necessary to establish permanent drainage through the perineal region.

Adhesive strips make an efficient medium for support in fracture of the bones of the pelvis, especially in compound and comminuted cases, and wiring of the fragments is often done to advantage.

FRACTURE OF THE FEMUR

The thigh bone is well protected by muscular tissue from the hip to the knee, but owing to its exposure to external forces it frequently suffers fracture through its weakest parts. Fractures occurring through the surgical and anatomical neck of the

Fig. 160.—Fracture of the cervix femoris within the capsule. (*Howe.*)

femur, or the trochanters, are usually due to falls, crushing forces as from the passing of the wheels of a heavily laden wagon, and twisting force directed to the upper end of the bone while the foot remains fixed, in efforts to quickly change the position of the body. Fractures of the cervical neck occur more frequently in women than in men, and in advanced middle life and in old age; this is due to the anatomical length of the cervix femoris, and the position it assumes in the female in contrast to that of the male. And then, too, the bones become

exceedingly brittle in advanced life, on account of the excess of earthy matter that makes up the structure of the bones.

It has been determined by post mortem examination that fractures occurring to the cervix femoris and wholly within the capsular ligament are nearly always transverse, while those outside of the capsular ligament are commonly oblique. Seldom, if ever, can osseous union be obtained between the fragments of the cervical neck; a ligamentous union is about the only result hoped for. Osseous consolidation between the fragments outside of the capsular ligament is usually obtained when all things connected with the injury are favorable; along this line must be considered the holding in apposition the ends of the fractured

Fig. 161.—Ligamentous union following fracture of the neck of the femur within the capsule. (*Howe.*)

bone by retaining apparatus to prevent displacement, and to enjoin rest, and prevent mobility.

Separation of the epiphysis from the cervix femoris through direct violence is occasionally observed in the young, but the accident is not as common as fracture through the cervix. The synovial membrane usually suffers laceration to a greater or less extent in fractures of the cervix, which to some extent lessens the blood supply to the distal fragment.

The common symptoms of fracture of the cervix within the capsule, and the fractures that extend from within the capsule through the base of the neck, are loss of motion of the limb, pain, crepitus, eversion of the foot in the majority of cases, although the foot assumes the inverted posture in not a few instances; and shortening.   The latter symptom may not be marked immediately following the injury, but it is likely to increase from day to day, until it amounts to an inch or more. The majority of the above symptoms will be less marked in impacted fractures.

In taking measurements to determine the existence of a fracture of the cervical end of the femur, care must be taken to have the limbs in the same posture. The points between which the measurements are taken are the umbilicus, symphysis pubis, or anterior superior spine of the ilium, and the external or internal malleolus.

It is not always easy to determine whether a fracture of the cervix is intracapsular or extracapsular, or if confined to the cervix femoris, the extent the capsule is lacerated, if at all. The injury must be differentiated from that of dislocation of the hip, which is readily determined by noting the absence of the head of the femur from the pubic region, the everted posture of the

Fig. 162.—Consolidation following impacted fracture of the upper end of the femur.
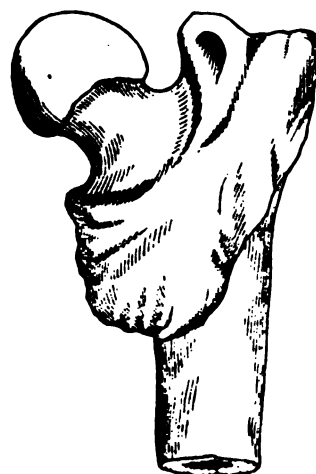
Fig. 163.—Repairative material, known as callus, shown in a case of extra-capsular fracture of the femur.

foot which is usually observed in fracture, and the absence of rigidity of muscles usually present in luxation of the hip, besides being more or less flexed and adducted. The cervical fracture must also be excluded from a fracture of the acetabulum, with penetration of the head of the femur into the pelvic cavity. Examination should always be made with the patient under the influence of chloroform, unless seriously objected to by patient and friends; and even then great care should be exercised not to increase the displacement by undue manipulation. When possible, determine the nature of the injury by the x-ray.

Treatment. As fracture of the cervix femoris and the base of the neck usually takes place in the aged, the first and most important indication is to support the strength of the patient; the next step is the reduction of the fracture, and the third step is to secure union of the fragments by the adjustment of proper retaining apparatus to prevent displacement and restrain mobility, if this be possible to accomplish. In an attempt to accomplish the latter, the limb should be immobilized with long sandbags, or the long side splint, after the fractured parts have been adjusted by manipulative procedures. If extension is required, and it is in the majority of cases of this form of fracture, it is best accomplished by fastening the foot to the footboard of the

Fig. 164.—Strips of adhesive plaster applied to the foot and ankle. The long strips are fastened to the foot of the bed when it it desired to make extension in the treatment of fractures of the leg.

bed with adhesive strips applied to the lower part of the leg as represented in the cut. The foot of the bed should be raised four to six inches which will allow the patient's body to incline in the opposite direction. Sand-bags will insure moderate support when placed on either side of the leg and hips. They should be made twelve to fifteen inches in length, and about six inches in width. Continuous traction by means of the weight and pulley is in common use with many surgeons, but this means of extension usually provokes a greater amount of pain than the other method referred to above. Excellent results have been obtained by rest in bed, with such support as is possible to give the injured parts by the long side-splint, well padded and adjusted to the thorax, thigh and leg by strips of adhesive plaster, with little or no extension of the leg. Encasement of the pelvis and both limbs in a plaster cast over plenty of padding affords a means of immobilizing the fractured parts that is
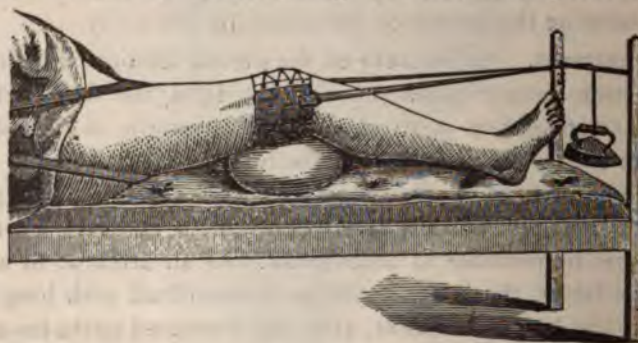
Fig. 165.—Extension by means of weight and pulley; counter-extension being provided for by a perineal band, which is fastened to the head of the bed. (*Howe.*)

especially useful in children and nervous patients. The Phelp's metal splint, originally designed for the treatment of hip-joint disease, is a useful appliance in fracture of the cervical end of the femur, as with it adjusted the leg can be well immobilized and the necessary extension made.

A point worthy of mention is the great amount of reparative material usually thrown out about the fractured parts in the cervical region, which can be readily determined by manipulation.

The general treatment should be supportive and stimulating, especially in the aged and poorly nourished. Eggs, beef, and milk prepared in various ways are to be taken freely, as well as ice cream, malted milk, custards, and fruits. Special attention must be given to the regulation of the kidneys and bowels, and the prominent parts of the pelvis should be bathed with alcohol and water, or witch-hazel frequently, to prevent bed-sores.

Ossific repair of fractures about the cervical end of the femur are notably slow; union generally takes place in from two to three months. It may be necessary to get the patient up and about in the open air, after adjusting an ambulatory fracture splint, in cases that do not bear confinement well.

Fracture of the Trochanters.

Fracture of the trochanters, major and minor, are not commonly met with, and even statistical tables record but few instances where this injury has been observed by surgeons of extensive experience. When the injury does occur, it is usually in connection with fractures of the cervical base of the femur, and exists rather as a complication instead of a distinct or independent fracture. When a fracture of the great trochanter does occur, it is usually the result of a fall upon the hip, or crushing violence directed against the body eminence by being caught between moving bodies, as the bumpers of cars. A fracture of the lesser trochanter usually results from a fall or from forcible muscular action. Through the muscular contraction of the psoas magnus muscle the lesser trochanter is drawn away from the shaft of the femur in fracture

of that eminence of bone, and the greater trochanter is drawn away from the base of the cervix femoris by the contraction of the gluteus medius, obturator internus, and pyriformis muscles.

The common symptoms of fracture of the great trochanter are eversion of the foot, a marked prominence in the region of the trochanter, with pain on pressure, and crepitus on manipulation, or rotating the limb.

Treatment: Owing to the masked position of the fractured eminence of bone, little can be accomplished by manipulative efforts to press the trochanter into its normal position, and maintain it there by any form of retaining apparatus. The limb should be rotated outward and slightly abducted, and ad-

Fig. 166.—Comminuted fracture of the upper end of the femur.

hesive strips applied above the trochanter, and brought down on either side of the thigh, and made fast by several turns of a roller bandage. The leg should be placed in the proper position and immobilized with sand-bags. Fracture of the lesser trochanter is seldom recognized, but when determined it should be treated by abduction and immobilization.

Fracture of Shaft of Femur.

Fractures occurring to the shaft of the femur may be due to falls from a height, the force being transmitted to the shaft of the bone; to direct violence, as from a kick from a horse, or from the passage of the wheels of a heavy loaded wagon, and to a

gunshot missile. A fracture of the femur is usually spoken of as oblique or transverse, but in the large majority of cases of fractured injuries to the shaft, the character of the break partakes of both forms mentioned. Often the fractured end of the bone exhibits a serrated surface which will prevent misplacement, unless the force directed against the femur be extremely violent.

In young subjects, the fracture is frequently complicated to a greater or less extent by a spicula of bone chipped off from the femur becoming wedged in between the opposing ends of the broken femur; especially is this apt to occur when the fracture is due to indirect violence, as in falling from a height, the patient striking upon the feet. When this complication is suspected it is proper to cut down upon the fractured bone and explore the injured area with the finger, and remove any frag-

Fig. 167.—Fracture through the upper third of the shaft of the femur, showing a tendency of the fragments to overlap. (*Howe.*)

Fig. 168.—Oblique fracture through the lower third of the femur, the lower fragment encroaching upon the popliteal space.

ments that may be found before attempting to adjust the fracture. It is not always easy to determine the exact nature of a fracture by external manipulations.

Extreme obliquity of the fractured bone often converts a simple fracture into a compound and complicated one by severing important vessels and nerves, and penetrating muscular tissue and the skin by the sharp and jagged end of the upper or lower fragment, usually the upper. Fractured extremities of the femur are often made to produce an angular appearance of the leg through muscular contraction, tilting the end of the bones out of the normal line. Gangrene often follows punctured injuries of important blood vessels and nerves, especially when a thrombus occludes the blood vessel as a result of the injury.

Two or more fractures may occur to the femur at the same time, when the fracturing force is due to direct violence, which is also responsible for the greater number of comminuted or splintered fractures, while fractures complicated by fissures extending in opposite directions are due to gunshot injuries.

The usual symptoms observed in fractures of the femur are pain, deformity, crepitus, loss of function, and abnormal mobility. Measurement of the two limbs from a fixed point as the symphysis pubis, or the anterior superior spinous process of the ilium of each side to the tip of the external malleolus, affords a means of value in determining the existence of a fracture. The shortening that such measurements will determine will vary from one-half of an inch to several inches.

The prognosis in fracture of the femur should be guarded, as, to a certain extent, the injury is a serious one on account of the length of time the patient will be confined to his bed, which often makes serous inroads upon the general health, causing bed-sores on pressure points, nervous conditions often resulting from the shock and confinement, and in the end a shortening of the limb results after every effort has been resorted to to prevent the same.

Treatment. The treatment that should be adopted, to be successful, will be suggested after determining the location and the nature of the fracture. Several varieties of splints are in use for the treatment of fracture of the femur and when properly

applied each form has many excellent results to its credit. The object sought by the surgeon is the immobilization of the fractured parts, once they are placed in apposition, and the dressing that is light and easily adjusted should be the one selected to bring about the desired end. In children and persons of a nervous disposition the long side splint, which is represented in the accompanying cut, when properly adjusted to the limb and pelvis and secured by bandages, gives very little discomfort and holds the fractured parts securely. The foot piece to the splint is provided with two or more half-inch holes through which strands of muslin or strips of adhesive plaster may be passed and tied, after having been made fast to the ankle and leg by several cir-
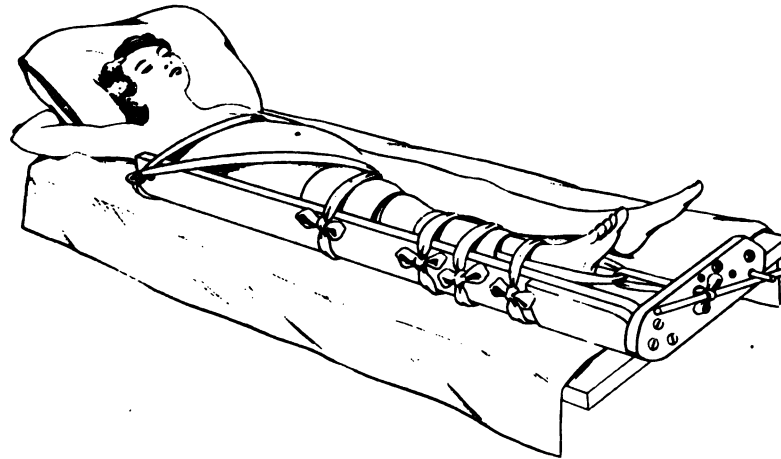
Fig. 169.—A serviceable splint for the treatment of fracture of the femur and the bones of the leg. It securely fixes the limb, and prevents shortening.

cular turns of strips of the same material. If extension is desired, which is demanded in most cases, pass a small stick or stout penholder through the loop outside of the foot-piece and by twisting or taking up the slack in the strands the desired extension may be obtained.

In ten days to two weeks, or as soon as the acute inflammatory symptoms and swelling have subsided, the leg and pelvis may be encased in a plaster-of-Paris cast, which can be cut down in front after a few days and sprung open far enough that the

Fig. 170.—Union of the fragments in fracture of the femur, with shortening and angular deformity. (*Howe.*)

Fig. 171.—Union of fracture of the femur in the upper third, with some deformity, and showing marked enlargement at the seat of fracture Not an uncommon occurrence.

leg may be examined for vesicles and excoriations, if these conditions are suspected to exist. Buck's extension splint and Phelp's hip splint are in common use by many prominent surgeons in the treatment of fractures of the femur. Extension and immobilization are well provided for in the Phelp's splint, and the patient can conveniently endure it at any period
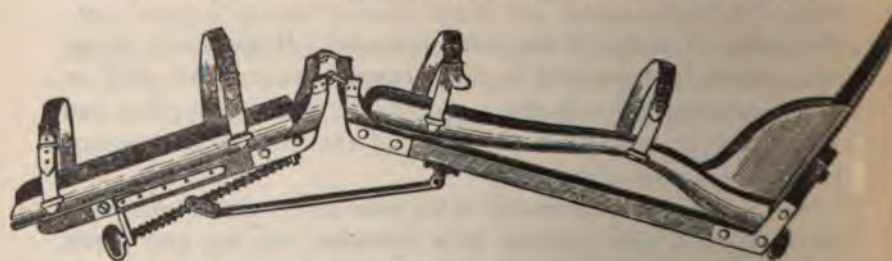
Fig. 172.—Welch's double inclined splint, for treatment of the femur.
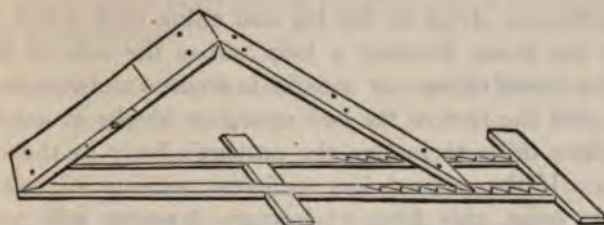
Fig. 173.—Double inclined splint.

of the injury. The double inclined plane is especially useful in the treatment of fractures with extensive loss of bone and comminuted and compound fractures attended with great swelling and restricted circulation, when traction is not desired.

Excellent results have been obtained, in the treatment of fracture of the femur, from the proper adjustment of four or five splints made of wood and padded and applied to the thigh around the site of the fracture, and tied with strands of muslin while extension and counter-extension are being produced by assistants. These splints should be ten to twelve inches in length and placed equal distances apart around the thighs, and extend equal distances above and below the line of fracture. These sustaining splints are held in place by running on a roller bandage, which may extend above and below the splints if much swelling ensues. Extension is made by ad-
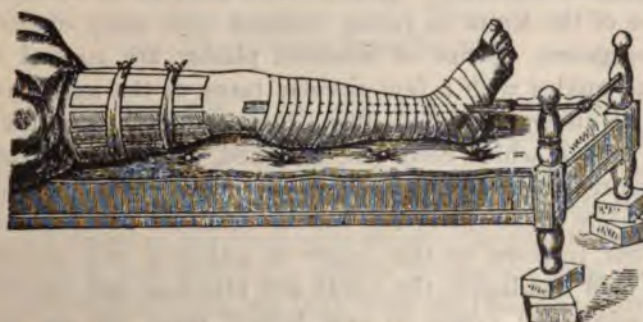
Fig. 174.—A method of making extension in fracture of the femur, and splints adjusted about the seat of fracture to prevent motion. Note that the foot of the bed is raised upon blocks to facilitate the body inclining away from the foot of the bed, to the rail of which the foot is secured by adhesive strips.

justing adhesive strips to the leg and ankle with a few circular turns of the same, forming a loop across the sole of the foot, to which a strand of tape or muslin is secured and fastened to the bed-rail, and the foot of the bed raised on blocks of wood six to eight inches thick to incline the patient's body in the opposite direction. If the patient has sufficient amount of self-control to remain quiet, this form of fracture dressing will prove all-sufficient, aided perhaps by immobilizing the leg by placing several sand bags along the leg from the hip to the foot.

On account of the tilting of the upper fragment in fracture of the upper third of the femur, the thigh should be placed in a partially flexed position and slightly abducted to bring the lower fragment on a line with the upper one. This can be accomplished by placing a sand bag beneath the knee, and making extension from the knee joint. If no complications follow a fractural injury, abnormal mobility will have disappeared by the end of six weeks, to the extent that extension will be no longer needed. The limb should be encased, however, in a plaster cast to give support to the same and prevent angular displacement. The cast should be worn for four or five weeks longer or until the union of the fragments is sufficiently strong to subsequently prevent deformity.

Vertical suspension is a favorite method of treatment of fracture of the femur in young children with many of our foremost surgeons. Strips of adhesive plaster are applied to the legs and ankles with a few circular turns of the same material to insure adherence. The strips form a loop across the soles of the feet to which cords are attached, these cords extending and secured to cleats or screw-eyes made fast to the ceiling immediately above the bed or cot on which the patient is to rest. After the fracture of the femur is adjusted and secured by splints and bandaged, the cords are attached and adjusted so as to allow the pelvis to rest lightly upon the cot or bed. The advantage claimed for this method of treating fracture of the femur over others, is the ability to keep the child clean and dry during the period of confinement, which can not be done so readily when the usual dressings are adjusted. The po-

sition is very comfortably borne by most children subjected to this form of treatment.

In fractures of the femur near the knee-joint, the tilting of the lower fragment often proves an obstacle to keeping the ends of the bone in apposition until the union has taken place. The Hodgen suspended splint affords a very satisfactory means of treating this injury, as does the placing of a sand bag under the knee-joint, making extension by means of adhesive strips fastened to the knee and lower portion of the thigh, as seen in the cut.
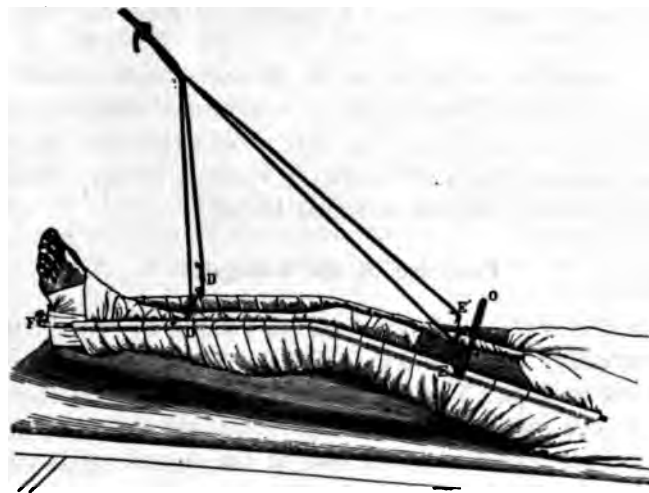
Fig. 175.—Hodgen's suspended splint.

In fractures of the femur complicated with lacerated injuries, or division of the important blood vessels, amputation of the limb is usually demanded at once, as gangrene generally follows within a short time any or all efforts to save the limb. A delayed union of the fragments during the first two or three months should not discourage efforts to produce solid union by thoroughly immobilizing the limb with sand bags and waiting a month or two longer, providing the general health is good and no complications arise; or the limb may be encased in a plaster cast for a considerable distance above and below the line of fracture, the patient allowed to go about on crutches bearing

some weight upon the fractured limb which produces more or less irritation about the seat of fracture, which accelerates the reparative process and ultimate consolidation. Cases of delayed union have become solid after a period of six months by following this form of treatment. Patients suffering from anæmia, loss of appetite, and having the general appearance of a deficiency of healing power, will do well on the following tonic mixture:

R̸.
    Fowler's solution of arsenic ....ℨ ss.
    Syrup lactophosphate of lime .... fl. ℥ iv.
M. Sig.—A teaspoonful in a wineglassful of water one hour
    after meals.

In connection with the above remedial compound the patient should take a small dose of sulphide of calcium (gr. ¼) two or three times a day. The diet should comprise eggs, beef, and the coarser breakfast foods, as cracked wheat, rolled oats, including graham and whole wheat bread.

Fracture of the Condyles.

Fracture through the condyles is not a frequent occurrence, and fortunately is this the case, for very serious results usually attend the injury. The injury is generally the result of violence directly applied to the knee-joint, as the passage of a wagon wheel over the lower end of the femur, or having the

Fig. 176.—Fracture of the internal condyle of the femur.

knee caught between heavy moving bodies. If the injury is the result of a crushing force the lower end of the femur may be broken into numerous pieces and the soft structures lacerated to the extent that the injury be severely complicated. As the result of a complication of this nature, inflammatory action

usually terminates in suppuration and sloughing of the soft tissues, and not infrequently necessitates amputation of the leg.

In fracture of the condyles of the femur, the line of separation between the fragments and the femur usually begins near the center of the lower end of the articular surface of the femur and extends upward and inward, and upward and outward, terminating at about the condyloid ridge, some four or five inches from the articular surface of the bone.

The pain that usually attends a fracture of the condyles is acute and intense; the fracture line between the fragments is determined by grasping the lower end of the femur and moving the fragments backward and forward. The inability of bearing the weight of the body upon the limb and the puffy swelling about the joint are marked features of the injury. There may be shortening of the limb, but this is not a marked diagnostic symptom; in crushed injuries to the lower end of the femur, this feature might indicate an inpacted fracture of the bone. On account of the acute swelling or displacement of the fragments, the knee-joint soon presents a marked enlargement following the injury. Crepitus can be detected in all cases, and the deformity often aids in the diagnosis.

Fracture of the bones, involving the knee-joint, is serious, both as regards the recovery of the use of the limb and in many cases, even the life of the patient. Both of these conditions depend largely upon the nature and gravity of the case, as regards the extent of the arthritis and the suppuration that follows.

Fig. 177.—Fracture bed and double wire splint adjusted to the legs.

Marked success has followed the treatment of fractures of the condyles by the proper adjustment of the Hodgen or the woven wire splint after the broken fragments have first been replaced; the limb should be placed in a slightly flexed position and extension made by fastening the foot to the foot-board of the bed by strips of adhesive plaster. Ice bags kept in touch with the joint will aid in keeping down acute inflammation and assuage pain. Compound and complicated cases often tax the skill of the surgeon to the limit; if a laceration of an artery can be determined, an attempt may be made to cut down upon and ligate it. And should the gravity of the injury determine that most of the important vessels and nerves have suffered injury, immediate amputation may be justifiable in an effort to thwart serious complications that may threaten the life of the patient.

Separation of the Epiphysis.

A separation of the epiphysis from the lower end of the femur is not an uncommon accident, and is due in the large majority of cases to violence directed to the end of the bone through the medium of the leg by forcibly extending it, or in twisting it, as by having the leg caught between the spokes of a revolving wheel. Direct violence is frequently responsible for the accident.

Prominent symptoms of this injury are not unlike those of fracture of the condyles, from which the separation should be differentiated. The symptoms in common are pain, swelling, crepitus, and deformity; however, an examination under anæsthesia will usually determine the identity of the displaced fragment, and the relation that it occupies to the lower end of the femur. Further manipulation will perhaps enable the surgeon to slide or press the detached fragment into its normal position at the end of the femur, and that rotating the limb will not produce the increased width of the joint that is frequently observed in fractures of the condyles. The injury is also to be excluded from dislocation of the knee-joint, which is done by distinguishing the minor rigidity from the great amount usually present in dislocation of the latter. In case of rupture of the important vessels, a tumefaction will soon appear near the

seat of injury and there will be an absence of pulsation of the arteries below the knee.

Treatment. The treatment of this injury will be about along the lines advised in the treatment of fracture of the condyles; the chances for recovering the normal use of the knee joint are, in the main, a little more favorable than in fracture of the condyles, but the danger from shock, infection, and the liability of amputation, are about as great as in the latter injury. If in simple cases the displaced fragment cannot be replaced by extending the limb and by manipulative force, an incision should be carried down to the fracture that any existing obstacle may be detected and removed; should the latter course be resorted to, the incision should be made on the outer side of the site of the injury and in front of the biceps tendon, when the soft parts can be held apart with retractors while the line of fracture can be cleared of shreds of periosteum and perhaps lacerated muscular tissue. Following the reduction of the fragment, the leg should be made secure in a Hodgen's suspended splint, in a partially flexed position, or immobilized in a plaster cast as soon as the acute inflammatory action has subsided. By making slight extension through the medium of strips of adhesive plaster fastened to the lower part of the leg and ankle, as has been frequently described, and fastened to the foot of the bed, and the foot of the bed raised upon blocks of wood causing the body to incline in the opposite direction, the pain that usually attends this injury will be greatly relieved.

FRACTURE OF THE PATELLA

Owing to the exposed position of the patella, it is frequently fractured as a result of direct violence or from powerful muscular action. It is claimed that fracture of the patella represents fully two per cent of all fractures. The accident occurs more frequently in men than women or children, and is met with more often among laborers than in other walks of life.

The line of fracture is usually transverse or slightly oblique when due to direct violence, although a blow may break the bone into several pieces. The development of the patella within the

Fig. 178.—Transverse fracture of the Patella.

tendon of the quadriceps extensor exposes it to fracture by a vigorous contraction of that muscle, as in jumping, or in attempting to forcibly move some object with the foot, thus placing great strain upon the muscle. In a comminuted fracture of the patella, the fragments are seldom displaced to any great extent unless the fracturing force be unusually violent.

The symptoms attending a fracture of the patella are acute pain, sudden swelling from an **effusion of lymph** and blood, more or less deformity, retraction, crepitus on manipulation, and sudden loss of function.

Treatment. A method of treatment of fracture of the patella should be followed that will best serve to bring the fragments in apposition and thus retain them until the reparative

Fig. 179.—Ligamentous union following fracture of the patella.

force securely unites them. The result following most forms of procedure is a ligamentous union, and in such cases the function of the knee depends upon the distance existing between the fragments after such union. A method that is adopted by many surgeons is the adjustment of broad strips of adhesive plaster above and below the knee-cap, secured by several circular turns of the same. The leg should be extended, and the assistants should make traction upon the upper and lower muscles toward the knee while the surgeon secures the ends of the op-
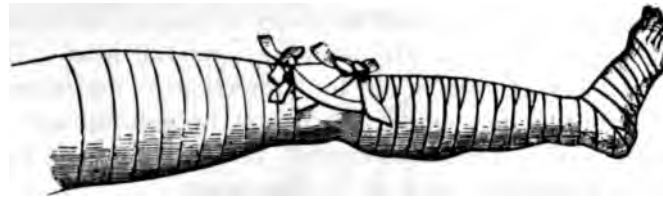
Fig. 180.—Howe's method of treating fracture of the patella.

posing adhesive strips by lacing, or strap and buckle over the patella and a pad that has been placed over the knee-cap. A posterior splint at least three feet in length should be bound to the leg to prevent flexion at the knee, and the leg and foot elevated upon pillows to relax the extensor muscles, and relieve congestion and pain. Cutting down upon the fragments the second or third day and wiring them together, after turning out blood clots and cutting away shreds of membranes that might interfere with apposition and union of the fractured parts, is a favored operative method in the treatment of other than comminuted fractures. The possibility of infection and subsequent suppuration must be taken into account when resorting to operative measures, but under strict antiseptic technic the danger is reduced to the minimum. Following the operative measures, the leg should be immobilized upon a padded splint or in a plaster cast for a period of three or four weeks, followed by massage, to reduce the tenderness of the parts and, if possible, prevent adhesions. A normal state following fracture of the patella is hardly to be looked for as the excess of callus that is usually present will cripple the function of the joint to a greater or less extent. If no complications are met with in the
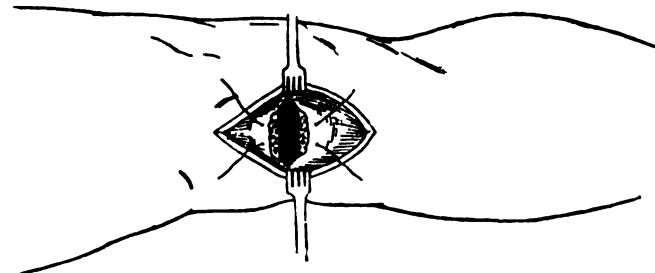
Fig. 181.—Wiring the patella for fracture. (McGrath.)

treatment, it will be prudent to resort to passive movements in four or five weeks, to aid in restoring a normal joint. The patient can wear an elastic cap for protection to the injured patella for four or five weeks, when first he gets up and about, as a safeguard to accidental injury. It will require six to eight weeks to secure firm union of the fragments.

FRACTURE OF THE TIBIA AND FIBULA

Fracture of one or both bones of the leg is a common accident between the ages of thirty and sixty years, especially in the laboring classes. The tibia is the principal bone of the leg, and supports the weight of the body. The fibula is a long slender bone which acts as a support to the tibia and contributes to the formation of the ankle joint. Both bones of the leg are more frequently broken by the fracturing force than either of them singly, and together they constitute about six per cent of all fractures.   Owing to the exposure of the tibia, it frequently suffers compound and complicated fractures from direct violence, such as kicks and blows with some hard object directed against
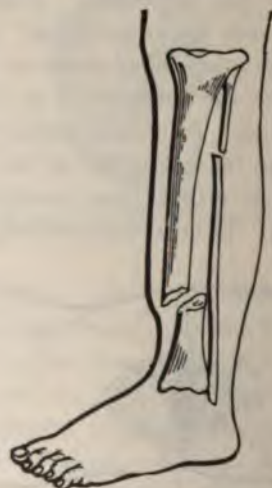
Fig. 182.—Fracture of both bones of the leg—the fibula through its upper, and the tibia through its lower third. (*Howe.*)

Fig. 183.—Union of fragments in fracture of both bones
of the leg, showing some deformity. (*Howe.*)

the bone, or from indirect force spent upon the tibia, breaking off
a fragment at either end of the shaft and splitting it in pieces by
having forced into it the end of the shaft. Fracture of the tibia,

Fig. 184.—Fracture of both bones of the leg in the lower
third, the result of direct violence.

resulting from indirect violence, usually occurs at or near the junction of the lower and middle third, while fractures by direct violence may occur at any point of the bone. The line of separation depends largely upon the character of the force that produced it; hence, the line may be transverse, oblique, irregular, and V-shaped. A common cause of fracture of the lower end of the tibia is by twisting the leg in falling, the foot being fixed.

Fracture of the tibia is quite readily determined by passing the fingers along the outline of the bone which lies very near the

Fig. 185.—Fracture of the tibia in the middle third.

surface, and, in addition, there are present the usual symptoms. pain, tenderness, crepitus, and loss of function. Hemorrhage may be met with as a complication at the inception of the injury, or at a later period, if the large blood vessels suffer bruising or laceration by the fracturing force.

A simple fracture, uncomplicated by infection or constitutional taints, will quite firmly unite in six to eight weeks: but a longer time will be required in complicated cases, especially when the fractured wound becomes infected and suppuration attacks the bone, terminating in a necrotic state. In cases of this nature, it may be months before the fragments become consolidated.

Not an uncommon accident is a separation of the lower epiphysis of the tibia by forcible dorsal flexion of the foot, while at the same time pressure is made against the sole. 'The most common cause of this fracture is extreme eversion of the foot, aided by the weight of the body. The separation of the epiphysis is nearly always attended by fracture of the fibula, producing a condition not unlike Pott's fracture. A separation of the upper epiphysis or fracture of the upper end of the tibia extending into the knee joint often threatens serious inflammatory conditions, if not the life of the patient from nervous shock.

Fig. 186.—Fracture of the fibula in its lower third, and a dislocation backward of the tarsus.

Fracture of the fibula generally results from kicks, blows, or, if the break is in the upper part of the bone, it may result from violent muscular action. Owing to the slender form of the bone, it is quite easily broken, but, because of its being deeply imbedded in muscular tissue, the fragments are only slightly displaced, except the fracture occurs through the upper part of the bone, when the contraction of the biceps may cause marked displacement of the fragment. Fracture of the fibula about three inches above the end of the malleolus, and fracture of the internal malleolus with rupture of the internal lateral and the tibiofibular ligaments, and in some cases fracture of the lower end of the tibia, constitute what is commonly known as

Fig. 187.—Pott's fracture, which is accompanied by a par-
tial dislocation of the tibia from the astragalus.   (*Howe.*)

Pott's fracture. The most common cause of Pott's fracture
a forced abduction of the foot, aided by the weight of the bod

Fig. 188.—Pott's fracture of the fibula and dislocation of
the tibia.

while at the same time there is imparted to the ankle more or less of a twisting motion, with eversion.

The common symptoms observed in fracture of the fibula are pain, tenderness, crepitus, abnormal mobility, and deformity if complicated by fracture of the tibia. Greater. deformity results from fracture of the lower end of the fibula, shown by a widening of the joint and marked swelling of the ankle, with unusual prominence of the internal malleolus in Pott's fracture.

Fig. 189.—A handkerchief adjusted about the foot and ankle, by means of which extension may be made when fastened to the foot of the bed, when treating fractures of the leg.

Treatment. The treatment of fracture of both bones of the leg requires extension and counter-extension with the aid of assistants, while the surgeon, by manipulation, presses the frag-

Fig. 190.—A gaiter-like appliance, which may be fashioned from a shoe-top, utilized for the purpose of making extension in the treatment of fracture of the leg, instead of the handkerchief.

... ... where they are retained
... ... the appearance of a plaster cast.
The ... ... necessary to prevent overlapping is ac-
... ... securing the foot to the foot-rail of the bed with
... adhesive plaster and the foot of the bed raised upon
... ... is ... recommended in this work. It is
... to ... the leg at the knee by placing a sand bag
... and ... the limb in this position by the use
of sand bags ... along the sides of the leg. Should the frac-
ture of ... be near the ... and extend into it, and the
displacement of the fragments seriously interfere with the func-
tion of the ... ... it may be necessary to cut down upon

... Fig. ... —The ... ... with straight
... ... legs.

... ... parts ... ... in their proper adjustment. Com-
pound fractures require careful antiseptic precaution to avoid
... ... infection ... and ... suppuration; should this be-
come a feature of the injury, the pus must be evacuated through
an incision at the side of the wound instead of attempting to
drain ... through the ... opening. If the soft parts over-
lying the fracture be badly bruised by the fracturing force, fol-
lowing the adjustment of the broken fragments, topical appli-
cation of cooling and anodyne lotions will be required to reduce
active inflammation and swelling before attempting to apply
the plaster cast. It will be well to have the leg rest upon or
snugly between two gauze bags filled with absorbent cotton or

support its weight, otherwise the prolonged pressure upon the heel may produce serious sloughing. Care should be exercised not to constrict the soft parts by bandaging too tightly when adjusting the fracture dressing; otherwise, vesication, followed by sloughs and obstinate ulcers, is liable to complicate the case. Extension and counter-extension should be maintained for three or four weeks, or until the union between the fragments is of sufficient density to prevent shortening.

The treatment of fracture of the tibia, in brief, is along the same lines as described for fracture of both bones of the leg. As a rule, there is little displacement, hence the fracture is readily adjusted by extension and manipulation. If there is much
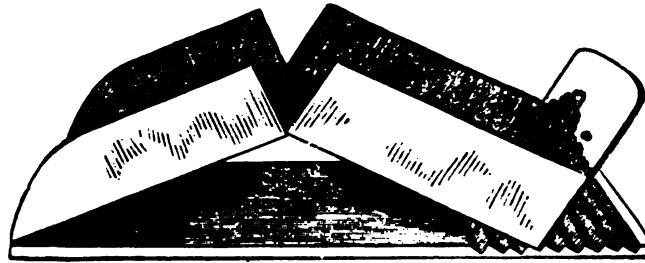
Fig. 192.—Double inclined plane fracture box.

swelling following the injury, the leg should not be encased in a plaster dressing at once, but the local disturbance should be relieved by cooling lotions and a pressure bandage. Sand bags are useful to steady or partially immobilize the leg in all forms of fractures; they should be made ten to twelve inches long, and six to eight inches wide. The fibula, when intact, serves well the office of a splint; besides, it prevents shortening of the tibia.

The common and very satisfactory dressing for a fracture of the fibula above the lower third of the bone, for the period of ten days or two weeks, is the padded splint adjusted to the outer side of the leg, and retained by the roller bandage; at the end of this time, if no complications present, a plaster dressing can be applied and the patient be permitted to go about on crutches. Should the fracture be near the upper end of the fibula, the cast
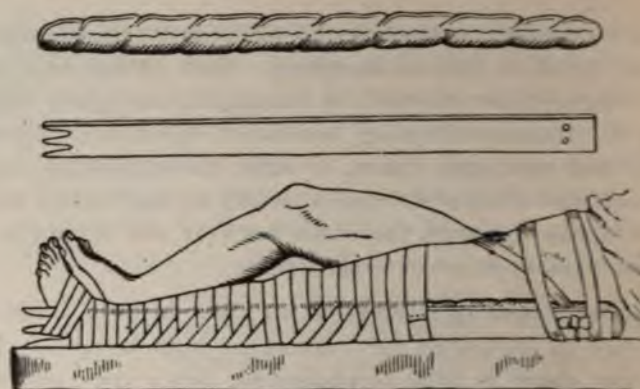
Fig. 193.—Padded cushion and straight splint, and the same adjusted to the leg and held in place with a spiral bandage. (*Howe.*)

should extend from the toes to about six inches above the knee joint, that the upper fragment may be firmly immobilized.

In Pott's fracture, after the fragments have been adjusted by manipulation, the retaining dressing may constitute two side splints with pads attached to each, that pressure and counter-pressure may be made to aid in holding the end of the fragments in apposition (see cut), or Dupuytren's single splint, well padded, should be adjusted to the inner side of the leg and retained with adhesive strips or a roller-bandage. After ten days to two weeks, and all danger of swelling and abscess formations has passed, the leg can be encased in a plaster cast, which should extend from the base of the toes to the knee joint, and so fashioned at the ankle and held by the operator's hands while the plaster is setting, that the foot will be canted slightly inward. Due caution must be observed that the foot and leg be well enveloped in sheets of batting, to avoid excoriation and constriction, before the plaster bandage is run on. A point well

Fig. 194.—Straight splints, with compresses rightly placed for the treatment of Pott's fracture of the leg.

Fig. 195.—Treatment of Pott's fracture of the leg with Dupuytren's splint, in place with several turns of a spiral bandage.

worth remembering in this connection is the appearance of the toes, which present a purplish hue should the soft parts be constricted by the plaster dressing.
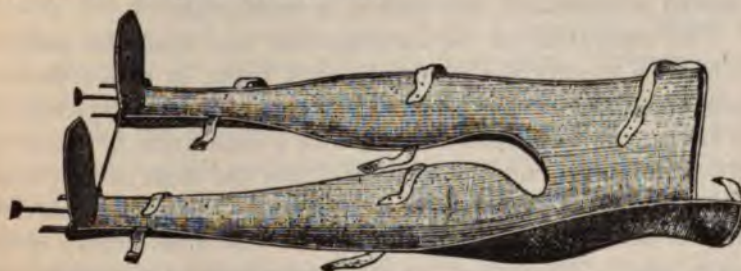
Fig. 196.—Wire-woven splint, useful in the treatment of fracture of both legs.

In compound fracture, ample provision must be provided for drainage, where infection and suppuration set in as a complication. Old cases of unreduced fracture, with a marked displacement of the fragments, will require operative measures to aid in restoring the ankle to anything like a normal state. Firm union may be expected in six to eight weeks in uncomplicated

Fig. 197.—Compound fracture of the leg.

cases; compound and complicated cases will require a longer
period of time.

SEPARATION OF THE EPIPHYSES–DIASTASIS

An accidental injury to certain of the bones, that is akin
to fracture, is the separation of the epiphyses from the body
of the bone of which they are a part. The injury is frequently
observed in childhood, but seldom in middle life.

The separation of the cartilaginous tips from the shaft of
the bone is usually the result of a fall, twist, or blows directed
against the injured part of the limb. Lifting a young child by
the hands has been known to produce a separation between the
cartilaginous extremity of the radius and the shaft of that bone.
When the epitrochlea suffers separation from the humerus,
which is not an uncommon injury, the "fractured" injury is not
always readily determined, as little deformity follows, and crep-
itus can seldom be elicited. Pain is usually very acute and the
use of the arm is greatly crippled.

The symptoms that soon manifest themselves following
diastasis are pain, swelling, discoloration, more or less defor-
mity, and limit of motion.

Treatment. The treatment of a separation of the carti-
laginous extremities of bones are not unlike that advised in an
ordinary fracture. The displaced fragment is reduced by ma-
nipulative methods, the patient being placed under the influence
of chloroform, and the limb flexed, or placed in such position
as will relieve the tension of muscular structures. After re-
duction, the limb or injured parts should be dressed with pad-
ded splints and bandaged, due care being exercised to arrange
for extension in cases requiring it. Injuries of this nature oc-
curring to the elbow joint are best treated by flexing the arm
at the elbow, and applying a plaster-of-Paris splint or cast after
the fracture is adjusted. If the plaster is not at hand,
make a cast out of a suitable sized piece of binder's board.

FRACTURE OF THE CLAVICLE

Fracture of the clavicle is frequently met with, especially in early life, when the injury is often produced by the child falling against some hard object. It is said that fracture of the clavicle is met with about as frequently in childhood as dislocation of the shoulder is in adult life.

Anatomically considered, the clavicle is composed of a shaft and two articular extremities. The bone is about six inches in length, the shaft is slender throughout the middle, gradually getting larger and stronger toward the extremities, which are well protected by strong articular ligaments. Surgeons have divided fractures of the clavicle into three classes, merely for the convenience of description, viz: the inner, middle, and outer thirds, each section comprising about two inches. The articular end of the inner third is attached to the sternum and to the cartilage of the first rib by the sterno-clavicular and costo-clavicular ligaments. The sterno-cleido-mastoid muscle is attached to the superior surface of the inner third of the bone, while the trapezius occupies a like position on the outer third. A fracture occurring at the juncture of the outer and middle third, or on a line of the inner and middle third of the bone, is very apt to be attended with more or less deformity by having the outer and inner extremities drawn upwards by muscular contraction; this deformity would no doubt be pronounced if the force of the above named muscles were not modified by the muscles attached to the under surface of each extremity, viz: the pectoralis major, and the deltoid.

Fractures of the clavicle may be transverse, or oblique in form; and simple, compound, comminuted and complicated in character, depending largely upon the force causing the injury. Fracture of the clavicle is met with in all ages of life, most frequently in childhood, and in males of middle and adult age more frequently than females, on account of their hazardous occupations. The fractured injury is frequently due to direct violence, as kicks, blows, or to falls, the clavicle coming in contact with some hard object; and to indirect forces directed to the bone through the medium of the arm and shoulder by falls upon the elbow or hand. Oblique fracture of the clavicle with

overlapping is due in most cases to indirect forces conveyed to the bone.

The prominent symptoms accompanying fracture of the clavicle are localized pain, mobility, deformity, and crepitus, attended with diminution of function. In fractures with marked overlapping of the fragments, there will be a noticeable drooping and falling inward of the shoulder, which is most apparent when compared with the sound one, and viewed from behind. To obtain crepitus in cases where there is marked overlapping, the shoulder will have to be drawn backward and outward, that the fractured surfaces may be brought in contact. In simple fracture without displacement, a diagnostic symptom worthy of note is local pain upon pressure, and this symptom is forcibly emphasized a few days later by the "lump" or mass of reparative material deposited in and around the line of separation. Cases are on record where the clavicle has been broken during intrauterine life from violence displayed against the mother's abdomen.

Treatment. The treatment consists in reducing the fracture and the application of some form of retaining apparatus to prevent its recurrence. To accomplish the first step, where there is overlapping or great angular deformity, the shoulder is carried upwards, backwards, and outwards, and held in this position by an assistant while the retaining dressing is adjusted. The coaptation of the fractured ends of the bone is aided by manipulative force exercised by the surgeon, while the assistant holds the shoulder in a super-corrected position.

As a retaining dressing to hold the shoulder upwards, outwards, and backwards, and in a measure immobilize the injured parts, numerous kinds of apparatus are in practical use. A form of dressing that has given excellent results is the figure of eight appliance of a three inch bandage adjusted across the back from shoulder to shoulder, as shown in the cut. A suitable pad is first placed in the axilla, and the arm is suspended in a sling, which should be sufficiently short to make the necessary upward pressure.

Sayre's dressing, which is composed of three inch strips of adhesive plaster, and of sufficient length to loop around the arm

of the affected side near the shoulder, and thence around the body, and secured in the back, is an ideal dressing for children, and others who are hard to hold under restraint. After the adhesive strip is looped around the arm near the shoulder, the arm should be drawn well backward while the strip is secured around the body. The next step is to adjust the second strip of plaster from about four inches above the elbow, posteriorly, down and over the elbow, and up over the

Fig. 198.—A figure-of-eight bandage dressing for the treatment of fracture of the clavicle.

entire length of the flexed forearm and hand, and on over the shoulder and secured to the back. Before securing the distal end of this second strip to the back, the elbow of the injured side should be drawn well forward; besides the strip of plaster should be split at the point where it passes over the elbow, that no undue pressure may be made. Other strips of plaster may be placed around the forearm to more thoroughly secure the second strip adjusted to the arm, which will be necessary in some cases of restless children. If deformity caused by overlapping is marked, it will be necessary to place a pad in the

axilla before adjusting the adhesive strips to the arm and body, which will serve as a fulcrum to hold the shoulder outwards.

Whatever kind of retaining dressing is selected for a fractured clavicle, the features of its efficiency should be the restraint of motion, and the overcoming of the deformity. The majority of cases of fracture of the clavicle recover with good use of the arm, if properly treated, and the patient carries out the advice of the surgical attendant; but deformity in a minor degree is frequently met with, following fractures, with marked overlapping of the fragments.

FRACTURE OF THE SCAPULA

Fractures of the body of the scapula occur as the result of direct violence; the fragments, however, are not greatly displaced, as the surface of the bone is well covered with strong muscular tissue. A crushing force may break the thin bone in several pieces, and yet the fragments preserve their normal relationship with each other. If overriding does occur, it generally takes place in fractures in the dependent portion of the bone.

The symptoms of fracture of the body of the scapula are abnormal outline of the injured part, unnatural mobility, crepitus and in some cases more or less ecchymosis appearing a few days

Fig. 199.—Comminuted fracture of the shoulder blade.

after the receipt of the injury. It may not be an easy matter to produce crepitus in very fat and fleshy persons, except by forcibly moving the arm backwards and forwards while the hand of the surgeon is placed over the scapula, a very unnecessary procedure.

Treatment: The treatment consists of reducing the fractures, if any displacement occurs, and then securing the arm by some one of the favored appliances in general use. In cases where the body of the bone is broken into several pieces, with a liability to overlapping, an excellent appliance is the figure-of-eight dressing run on over a suitable pad of cotton placed on the scapula. The same form of dressing may also be run on in front, from shoulder to shoulder, as is applied posteriorly, which will aid materially in mobilizing the injured shoulder. A suitable pad placed in the axilla will serve a good purpose in holding the shoulder in a normal position. In simple fracture, without much bruising to the soft parts, securing the arm in a sling, makes a suitable dressing to hold the fractured parts in apposition, in patients other than children and nervous individuals. The one feature of any form of dressing is to restrain motion: upon this, success depends. A suitable plaster cast to immobilize the shoulder may be required in children.

Fracture of the Acromion Process

Fracture of the acromion process of the scapula is more frequently met with than through the body of the bone; the latter injury constituting about one per cent of all other fractures combined. This process being a prominent part of the shoulder, and unprotected by extensive muscular structure, accounts for the frequent injuries the bone is liable to receive. In early life, the epiphysis is often separated from the main process by kicks, and blows, or by falling against some hard object. If fracture of the main process occurs, it is generally through the thin portion of the process near its junction with the body of the scapula, and is due to direct violence.

The prominent symptoms presenting in fracture of the acromion, are irregularity of outline when compared with the other shoulder, inability to raise the arm at right angles with

Fig. 200.—Fracture of the acromion process.

the body, abnormal mobility, crepitus, and more or less ecchymosis in and around the injury. Pain on pressure is also a feature of the injury, as is the depression discovered by passing the fingers over the line of fracture. Crepitus can not be readily obtained, except the arm be forced upwards, that the fragments be brought in contact. Many of the objective symptoms mentioned may be absent in cases seen two or three days after the injury, on account of extensive swelling following the fracture and the bruising of the soft parts.

The first step in the treatment is to force the humerus upward, that the head may press the broken acromion into place, aided by manipulative force by the surgeon's fingers. The second step in the adjustment of a sling or adhesive strips applied to the arm, so as to hold it up against the body of the scapula while osseous union takes place, which will be in about three to four weeks.

Fracture of the Coracoid Process

Fracture of the coracoid process is not of common occurrence, on account of its protection by the acromion above, and muscular structure. It is more frequently broken as the result of direct than indirect violence, although cases are on record where the injury has occurred as the result of forced flexion of the shoulder, and of dislocation of the head of the humerus; in the former the slender process is broken by being forced

against the inner end of the clavicle, and in the latter, it occurs by the head of the humerus being forced up against it.

When the coracoid process is fractured, it is usually displaced downwards and inwards by the action of the biceps, coraco-brachialis, and the pectoralis minor muscles.

The objective symptoms are abnormal mobility, and crepitus; the latter symptom may not be recognized unless the arm be flexed, and the muscles well relaxed to permit the broken
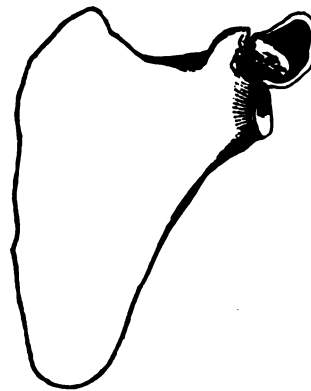
Fig. 201.—Fracture of the coracoid process.

fragment to be pushed into place. If the soft parts be much bruised and swollen, it may be impossible to bring the fractured surfaces together sufficiently to elicit crepitus sounds.

The object sought in the treatment of fracture of the coracoid process is the adjustment of the fragments, and to prevent mobility over a period of time sufficient to permit the broken fragments to unite, which under ordinary circumstances will take place in five or six weeks. The adjustment of strips of adhesive plaster to the elbow and forearm, the limb being flexed to relax muscular spasm, to elevate the head of the humerus against the process, is a favorite method with many surgeons; or the arm may be flexed at the elbow and then supported in a sling to elevate the limb, and then immobilized by several turns of a three-inch cotton bandage around the arm and body. The placing of a compress in the axilla will not be required.

Fracture of the Neck of the Scapula

That the neck of the scapula back of the coracoid process is the seat of fracture, through direct violence, is claimed by some and denied by other surgeons of extensive experience; this is noted by referring to numerous published works in many of our large medical libraries. Professor Stimson says, in his valuable work on Fractures and Dislocations, that "there is no known example of fracture of the neck of the scapula occurring close behind and parallel to the glenoid fossa." Prof. A. Jackson Howe, a surgeon of great experience, gives an account of a case of fracture of the scapula through the anatomical neck that he had professional charge of in his early career as a surgeon, in his work on

Fig. 202.—Fracture of the neck of the scapula.

Fractures and Dislocations, and cites the names of other surgeons that had met with cases of a similar nature. The injury is not a common one, but when received it is attended with symptoms common to fractures in other parts of the bone; besides a marked flattening of the shoulder, and the absence of the head of the humerus from the axilla. Any attempt to adjust the displaced head of the humerus is immediately followed by a return to the abnormal position from which the head of the humerus and the broken fragment had previously assumed. The injury is quite liable to be mistaken for dislocation of the humerus.

Treatment: The treatment recommended in this form of fracture is the same as that advised in fractures of the coracoid and acromion processes. The disengaged fragment is readjusted by elevating the humerus by supporting the elbow in a sling, or adhesive strips applied, as was advised in fracture of the clavicle. The object sought in any form of dressing is to prevent displacement and restrain mobility. Osseous union is generally secured between the fragments in three to four weeks.

FRACTURE OF THE HUMERUS

Owing to the exposure of the humerus to a display of external forces, the bone is frequently the seat of fracture. For descriptive convenience, surgeons have divided the humerus into the upper, middle, and lower thirds; fracture is spoken of as taking place through any one of these sections as well as at the junction of these divisions. Besides, the bone is liable to fracture through the anatomical or surgical neck, and the condyles at the lower extremity of the shaft. It is claimed by good authorities that fractures of the humerus constitute about four per cent of all other fractures combined.

Fractures of the upper extremity of the humerus may take place through the anatomical neck, the surgical neck, and besides, suffer a separation of the tuberosities from the shaft of the humerus; also, the upper epiphysis, during the period of early adult life. Simple fractures of the head of the humerus seldom take place.

Fractures through the anatomical neck are caused by direct violence, as from a fall, the shoulder coming in contact with some hard object. The injury is seldom, if ever, produced by indirect forces displayed against the head of the bone.

The symptoms usually observed in fracture of the anatomical neck of the humerus, are swelling, pain, loss of function, and crepitus upon forcibly manipulating the arm, and displacement in some cases. If the latter symptom is present in a marked degree, the distinctive features of a fracture of the anatomical neck should be compared with those of dislocation of the hum-

erus; bearing in mind that in fractures in general there is abnormal mobility, while in dislocation the limb is generally held rigidly in an abnormal position through spasm of muscles.

Treatment: Treatment is directed to correcting any displacement by manipulative force, if any be present, elevating the humerus sufficiently to hold the fractured surfaces together, and immobilizing the arm in this position through the medium of a properly adjusted sling or strips of adhesive plaster.

The ultimate recovery with osseous union between the fragments, and a normal use of the arm is somewhat problematic, because of the fact that the injury is intracapsular, a location contributing greatly to a retarded union, on account of deficient nutritious supply and the possible interference of the synovial fluid with the reparative material exuded from the fractured surfaces of the broken bone. The likelihood of complications of this nature arising, the surgeon will be justified in acquainting the patient and friends early in the treatment as to what may be the ultimate result of the treatment.

Fractures of the Surgical Neck.

Fractures occur more frequently through the surgical neck of the humerus, than at any other point above the insertion of the pectoralis and teres major muscles. The amount of displacement attending this injury will depend upon the extent of the force displayed against the bone.

The usual line of fracture is transverse, caused by direct violence directed against the upper end of the humerus; while force displayed against the elbow by falls is the principal cause of indirect fractures.

In extreme displacements of the oblique variety of fracture of the surgical neck, the jagged end of the lower portion of the bone may be forced into the soft parts, injuring important nerves and blood vessels, as well as tendinous structures around the joint. Force directed against the upper end of the humerus in children is very apt to produce a separation of the epiphysis, and in adult age fracture of the surgical neck. In attempts at a diagnosis two or three days after fracture through the surgical neck has taken place, the true condition obscured by active swelling, and more or less displacement present, the symptoms

of fracture are likely to be mistaken for some variety of dislocation of the humerus; however, upon careful manipulation, the head of the humerus will be found in position, preventing a flattening of the shoulder, which luxation of the humerus usually presents. Other symptoms indicating fracture are abnormal mobility, loss of function, pain, swelling and deformity.

Fractures with displacement will first require reduction of the broken fragments to their normal position, which can be accomplished by making traction upon the arm with one hand, while the upper end of the lower section is pressed into place. A suitable pad is placed in the axilla to prevent displacement inward of the upper end of the long fragment, and a shoulder splint fashioned like a cap at the upper end, and made of plaster-of-Paris, long enough to reach nearly to the elbow, will constitute a suitable dressing for the anterior portion of the humerus, which should be held in place by strips of adhesive plaster, or pieces of tapes tied around the arm. After the fractured parts are thus secured, the arm is flexed at the elbow and fastened to the side of the body by several turns of a roller bandage, to immobilize the injured limb. The wrist should be supported in a sling, hung from the neck, but not allowed to extend up over the elbow. As a rule it is not necessary to envelop the arm in a roller bandage previous to adjusting the retaining appliances to restrain swelling. It will be necessary to inspect the injured part of the arm occasionally for the first few days, that early symptoms of impending danger from inflammatory action may be discovered early. The surface of the injured region should be sponged with alcohol, to prevent irritation of the skin by the fracture dressing, for a few days following the injury. No complications arising during the period of treatment, passive motion should be commenced at about the third week, and the soft parts well massaged to prevent, if possible, ankylosis, a morbid lesion following fractures near a joint.

Fractures of the Shaft of the Humerus.

Fractures through any part of the humerus, between the attachment of the pectoralis major muscle and the condyles

Fig. 203.—Fracture of the shaft of the humerus. 1, the head of the humerus; 2, the shaft of the bone; 3, pectoralis major muscle; 4, deltoid muscle.

situated at the lower end of the bone, are said to be fractures of the shaft of the humerus.

The bone is so situated that, in case of fracture, the nature of the injury is not difficult to determine by methods of manipulation. The character of fractures that occur to the humerus are not unlike injuries of a like nature taking place in other long bones. The extent of displacement, when it occurs, will

Fig. 204.—Double fracture of the humerus. (*Howe.*)

depend upon the violence of the external force displayed against the bone, and muscular action immediately following the injury.

There is not the liability of serious complications attending fractures in the shaft of the humerus that there is to either extremity, and the anatomical conditions are exceptionally good for the use of appliances to prevent displacement and restrain mobility.

Fractures of the humerus occur as the result of external violence and powerful muscular action directed against some weak part of the bone; the former may come in the form of kicks, blows, and falls against some hard object, the latter through tests of strength with the arm extended, or by throwing or pitching some heavy weight. Complications may attend fractures of the shaft of the humerus, where great displacement occurs, the sharp projecting end of either fragment injuring important nerves and blood vessels, and lacerating adjacent muscular structures The injury may also be associated with a dislocation of the shoulder, not an uncommon accident.

Compound fractures of the humerus will receive the same care and treatment as like injuries in other long bones, special care being exercised at all times along aseptic lines. The surgeon determining that a fracture exists, should extend his examination to all parts of the bone, that other fractures may not escape undetected, if they exist.

Symptoms accompanying fractures of the humerus are those in common with like injuries in other long bones. There is swelling, pain, abnormal mobility, inability to use the arm, with more or less deformity, depending upon the extent of displacement. The wounding of important blood vessels will be followed by a weak and irregular pulse, numbness in the fingers, the nails blue and the hand cold and livid. Displacement frequently injures the musculo-spiral nerve, which is followed by tingling in the fingers from a slight effect, to a loss of sensation or paralysis, due to a complete division of the nerve.

Treatment: Treatment of fractures of the shaft of the humerus, consists in adjusting the fragments where displacement has taken place, and the placing of padded splints of thin

Fig 205.—Wooden strips fastened together with stout cloth or leather, and utilized in the treatment of fractures.

wood, two inches wide and eight to ten inches long on the anterior, posterior, and on each side of the humerus, these being held in place with strips of adhesive plaster or pieces of tape, tied in place by an assistant, while the surgeon makes extension and counter-extension to reduce the fracture; and over all, a roller bandage is run on to assist in immobilizing the broken flexed at the elbow and supported fragments. The arm is then in a sling, which is suspended from the neck, or pinned to the clothing in front of the chest. In a few days, or after the swelling has in a measure subsided, a retaining dressing of plaster-of-Paris is fashioned on the arm in a flexed position, extending from the wrist to the shoulder, with several turns about the chest, if needed to restrain motion in children or nervous persons. The cast is, of course, applied over a layer of cotton,

Fig. 206.—Ordinary dressing for fracture of the humerus. 1, 2, represent thin wood splints, two being placed on the other side of the humerus of the same kind. 5, sling in which the arm rests.

to prevent constriction. The anterior surface of the cast can be opened its entire length if subsequent swelling endangers the circulation of the limb. The plaster shell, supported by tapes tied about it, constitutes a dressing that will restrain excessive mobility.

Compound fractures will require a form of dressing that will admit of an occasional inspection of the external wound, and yet be of a nature to prevent mobility. A plaster cast will answer the purpose desired, with such portions of it cut away that will expose the wound to view, if desired, for subsequent dressing. It may be well to confine the patient to bed for ten days to two weeks, if the inflammatory action runs very high.

Fractures of the Lower End of the Humerus.

Fracture of the lower end of the humerus may take place above the articular surface, supracondyloid; through the external condyle, the line of fracture passing from above, downwards and inward; through the internal condyle, the line of fracture extending from a point above the epicondyle on the inner border of the humerus, downward and outward, involving

Fig. 207.—Fracture of the external condyle of the humerus.

the articular surface of the elbow joint. The epitrochlea may be separated from the inner condyle, constituting one of the common injuries about the elbow. The latter injury is produced by direct or indirect forces, directed against the projecting tuberosity by falls upon the elbow, and by kicks and blows; also by forcible muscular action, which often accompanies dislocation of the elbow joint.

Fractures that extend into the articular surfaces of the condyles are usually of a serious character; great pain, extensive swelling, and active inflammatory action generally following the injury. Falling upon the elbow, and great force directed

against the point of the elbow with moving bodies, has been the cause of splitting the condyles apart, the line of fracture extending upward and outward from the articular surface. In fractures of this kind, the lower end of the humerus is some-

Fig. 208.—Fracture of both condyles of the humerus.

times forced down between the condyles, spreading them apart to the extent that the appearance of the elbow resembles that of a dislocation. Not infrequently, a fracture through the condyles has, as a complication, a dislocation of both bones of the forearm.

The common symptoms present in fractures through the lower end of the humerus are swelling, pain, crepitus, ecchymosis, more or less deformity and inability to use the arm; also a recurrence following adjustment of the fracture unless immobilized. The ligamentous and muscular attachment to the condyles, and the position of the ulna from below, prevent any great displacement of the separated fragments.

Treatment: The first step by way of treatment is the adjustment of the broken fragments, which is followed by the application of some one of the popular elbow splints in general use, to immobilize the broken parts, the arm flexed at the elbow, with the hand resting in a sling, suspended from the neck. After the acute swelling has subsided, a plaster-of-Paris cast can be safely moulded to the elbow, extending a few inches above and below the injured parts, the inside of which should be well padded to prevent pressure against prominent or projecting points. In the absence of plaster-of-Paris, an excellent retaining dressing can be made of a piece of heavy pasteboard, fashioned as represented in the cut, and moulded about the elbow joint, and secured by a roller bandage. This form of splint

should be well padded before adjusting it about the elbow, to prevent making pressure sores upon extending parts.

It will be necessary to inspect the injured parts once or twice a day for a week following the injury, that unfavorable conditions may not complicate the treatment unobserved. Toward the end of the third week, the elbow should be massaged and subjected to passive motion to prevent anchylosis, a mor-

Fig. 209.—Fracture of the elbow dressed with a piece of pasteboard, cut as indicated in the illustration, and moistened before being made to conform to the joint. (*Howe.*)

bid state that is to be apprehended in injuries of this character. From this time the dressings can be laid aside, except in some nervous females and children, who will request that some form of support be continued for a longer period. The patient can hardly be trusted to make the necessary motion in the injured joint, as upon the infliction of a little pain they will desist from further efforts to exercise the elbow. Pronounced cases of anchylosis, presenting at the time of laying aside the splint, may require that passive motion be kept up for a year or more to fully restore the elbow to its normal function. The ma-

jority of cases of fracture of the lower end of the humerus that extend into the articulation, recover with a more or less modified action of the elbow joint.

FRACTURE OF THE LOWER END OF THE RADIUS—COLLES' FRACTURE

Governed by statistics the lower end of the radius stands next to the ribs in the order of frequency of fractured injuries. The injury usually results from indirect violence, as by falls

Fig. 210.—Fracture of the lower end of the radius. 1, the lower end of the humerus; 2, the ulna; 3, the radius. The action of the muscles in separating the fragments is shown in the cut.

upon the hand when extended to protect the body from injury. An oblique fracture of the lower end of the radius, one half to one inch above its carpal extremity is spoken of as Colles' fracture, while a fracture, similar in character, with the ex-

Fig. 211.—Fracture through the lower end of the radius, showing deformity.

ception that the line of separation extends into the articulation is known as Barton's fracture. These terms have no significance further than to give due credit to the eminent surgeons

who determined the nature of the fractured injuries upwards of seventy-five years ago.
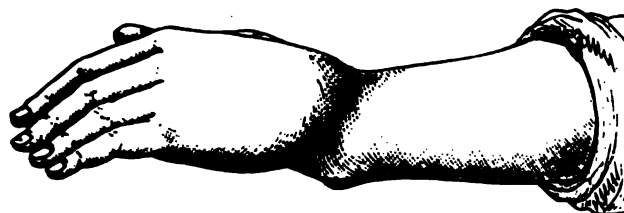
Fig. 212.—Appearance of the arm and hand in Colles' fracture of the radius.

The symptoms present in fracture of the lower end of the radius, are swelling, pain greatly intensified in rotating the wrist, deformity, especially of the silver fork appearance, and loss of function of the arm and hand. Crepitus can be obtained by rotating the wrist in a recent injury. By extending the hand a marked depression can be detected at the seat of fracture about an inch above the radial articulation. One cause of the marked deformity of the wrist following Colles' or Barton's fracture is the tilting forwards and upwards of the detached fragment by the contraction of the supinator longus muscle which is inserted into the distal end of the radius.

There is no period of life that the individual is exempt from the liability of fracture of the lower end of the radius; men are more liable to meet with the injury than women, owing to their hazardous occupations.
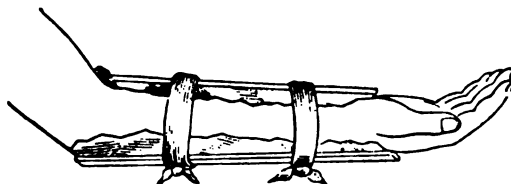
Fig. 213.—Treatment of fracture of the forearm, with padded splints held in place with tapes and a roller bandage.

Treatment: Several varieties of splints and other forms of dressings have been suggested by surgeons of experience to retain the broken fragments in the normal position once they

are properly adjusted. The anterior and posterior padded splint is adjusted to the fore-arm from the elbow to the end of the fingers, with a compress of cotton or gauze placed between the splint, and the prominent part of the displaced portion of the wrist, on either the posterior or anterior part of the arm and secured by three or four pieces of tape; the hand of the injured arm is now grasped by the surgeon and the necessary extension made to bring the broken ends of the fragments into apposition, the strands of tape are again tightened and a roller bandage run on to doubly secure the splints in place to prevent a recurrence of the displacement after it is properly adjusted, and this step is **the** feature of the treatment if recovery is expected without deformity.

A plaster-of-Paris bandage properly moulded to the fore-arm and hand while extension and counter-extension are being made, and the broken parts held in position, constitutes one of the best retention appliances that can be used in this fracture. A popular method of treating a Colles' fracture of the radius is to leave the fingers free that they may be flexed and extended as may be desired, hoping, by this exercise of the digits to prevent inflammatory adhesions of the tendons about the seat of the fracture. The other forms of dressings should be removed in about three weeks and the parts massaged and moderate motion imparted to the wrist joint every other day.

Excellent results have followed the treatment of fractures in the lower end of the radius with the single padded splint as advised by Prof. A. M. Phelps of the N. Y. Post Graduate school and hospital. The splint should reach from near the elbow to the metacarpo-phalangeal articulation, and should exceed the width of the arm by one quarter of an inch on either side, especially along the seat of the fracture. The upper end of the splint is secured to the arm below the elbow by strips of ad-

Fig. 214.—An efficient method of dressing fracture of the fore-arm with a single splint, extension being made and retained by strips of adhesive plaster.

hesive plaster, applied around the arm and obliquely as represented in the cut, indicated by the letters A. and B. When the end is thus secured the surgeon grasps the fingers of the patient's hand with those of his own, and with his thumb resting on the distal end of the splint he makes traction with the fingers and presses forward with the thumb, thus making the necessary extension of the wrist at the seat of the injury; while holding the fractured parts in a state of reduction the three or four strips of adhesive plaster an inch wide and nine or ten inches long, previously fastened across the entire width of the end of the splint are brought down obliquely forward and upward across the anterior aspect of the hand and wrist and secured. Before securing the splint in place a cotton compress should be placed between it and the projecting prominence on the back of the wrist; this done a roller bandage of gauze should be run on to hold the splint and its stays in place. The one feature necessary to emphasize in this method of treatment is the required amount of extension to overcome the deformity usually present. The one object sought in the choosing of any form of splint or cast is the immobilizing of the broken ends of bone in the normal position during the period of repair to prevent a false joint or noticeable deformity.

Fracture of the Shaft of the Radius.

Fracture of the shaft of the radius, through or near the middle third is usually caused by direct violence, although falling upon the hand has been known to produce the injury, and cases are on record that were said to be due to muscular action.

The amount of displacement that follows the injury will depend upon the seat of fracture, the violence of the force directed against the bone, and muscular action. If the fracture be near the middle of the shaft, contraction of the biceps tends to displace the lower end of the upper fragment upwards, while the pronator quadratus draws the lower fragment toward the ulna, resulting in a marked separation of the broken ends of the bone. Overlapping occurs only when the ulna suffers fracture or is dislocated at the time of the fracture of the radius.

Fig. 215.—Fracture through the middle third of the radius. 1, the lower end of the humerus; 2, biceps muscle, the contraction of which draws the upper fragment away from the end of the lower fragment; 3, the ends of the broken bone; 4, the ulna; 5, pronator radii teres; 6, supinator longus; 7, pronator quadratus.

Symptoms accompanying the fracture are preternatural mobility, pain on attempts to use the limb, numbness of the fingers, and more or less displacement. Crepitus can be elicited by rotating the bones of the fore-arm while making extension and counter-extension.

Treatment: The treatment consists in adjusting the broken fragments by extension and counter-extension and pressing the broken ends of bone in apposition, and the application of a padded splint or splints to the posterior and anterior parts of the fore-arm, well secured by running on a roller bandage. The fragments of the radius may be kept from resting against the ulna by making traction forcibly upon the hand downward and toward the ulna while the padded splints are adjusted to the arm, or a compress may be so placed upon the surface of the padded splints that the bones will be separated during the period of repair. The splints should be of sufficient length to extend from a point near the elbow to the ends of the fingers to restrain movements of the hand. A plaster cast can be moulded to the fore-arm and hand to advantage, especially in cases where a dislocation at the wrist complicates the fracture.

Fracture of the Head and Neck of the Radius.

Fracture frequently occurs to the upper extremity of the radius, the line of separation extending through the head, or transversely across the neck of the bone. The injury may result

from direct or indirect violence. Fractures extending mainly through the head of the radius are usually produced by wrenching the forearm, the line of separation may be transverse or pass downward through the shaft of the bone. A force of sufficient violence to dislocate the ulna and radius backward, not infrequently results in fracture of the upper end of the radius.

The upper extremity of the radius suffers fracture from direct violence, as by a kick from a horse, blows with some hard object, and missiles thrown from revolving machinery.

The symptoms of fracture of the head and neck of the radius are not always pronounced, unless marked displacement complicates the injury. Abnormal mobility is a common symptom of the injury. pain is a feature also in efforts to use the limb, and deformity marks the displacement of the fragments. If the fracture accompanies a dislocation of the ulna backwards, there will be present a rigid state of the muscles, and the forearm held in a partly flexed position. Crepitus can be elicited in these cases if the fracture is complete.

Treatment: The first step in the treatment of fractures of the head and neck of the radius, is to reduce the luxation of the bones of the forearm, if this complication exists: the broken fragments are then adjusted by manipulation and a fracture dressing applied that will sufficiently immobilize the parts during the period of healing. The pasteboard appliance, that was advised in the treatment of fracture of the condyles of the humerus, will prove efficient in the treatment of fractures of the upper end of the radius, as will a plaster-of-Paris cast, fashioned about the elbow in such a way that the forearm will be held in a supinated position and well flexed at the elbow, that the biceps and other flexor muscles will be well relaxed, so as not to disengage the broken fragments through muscular spasm. The immobilizing appliances can, in most cases, be removed in three weeks, when the elbow should be massaged and passive motion resorted to for several weeks, that anchylosis be prevented in the end. If the head of the radius is separated from the shaft and is displaced crosswise, excision is demanded in some cases.

FRACTURE OF THE SHAFTS OF BOTH BONES OF THE FORE-ARM

The radius and ulna are both broken by forces displayed against their shafts directly or indirectly; there are cases also on record where fractures of these bones have occurred through muscular action, augmented perhaps by the display of a contributing force, as pitching a heavy weight, and in rising upon the hand in attempts to sustain the weight of body upon the hand. A kick from a horse will produce the injury as will a blow struck with some hard object.

Fig. 216.—Fracture of both bones of the arm, with the ends of the fragments drawn out of position by muscular action. 1, the lower end of the humerus; 2, tendon of the biceps; 3, ends of the radius; 4, fractured ends of the ulna; 5, pronator radii teres; 6, supinator longus; 7, pronator quadratus.

Transverse fractures without serious injury to the periosteal covering will not exhibit any degree of displacement, although the other characteristic symptoms of fracture will be present and determine the nature of the injury; viz, pain in attempts to use the limb, abnormal mobility, angular deformity, and loss of function. Overlapping is often observed in oblique fractures, and marked deformity in lateral displacements is frequently noted in transverse fractures. The middle and lower third of the shafts suffer fractures more frequently than does the upper half of the bones, owing to the greater exposure of the distal ends of these bones to external violence, and the little protection given them by the overlying muscular structures. Crepitus can not be elicited in marked cases of displacement until the ends of the broken fragments are brought into apposition by extension and counter-extension followed by ro-

tating the arm. The external violence producing the fractures of the radius and ulna may also crush and lacerate the overlying soft parts, including the important blood vessels and nerves, eventuating in destructive inflammatory action and gangrene, necessitating amputation. Compound and comminuted fractures of both bones of the fore-arm are serious injuries, and usually result from the passage of a wheel of a heavily loaded wagon, or from having the arm caught in revolving machinery. The prognosis in these cases should be guarded, as the saving of the limb will depend upon the injury done to the important vessels and nerves that stimulate and carry nourishment to the parts beyond the seat of fracture.

The causes and symptoms accompanying the various forms of fractures of the bones of the fore-arm have been alluded to above; and the diagnosis is quite easily determined.
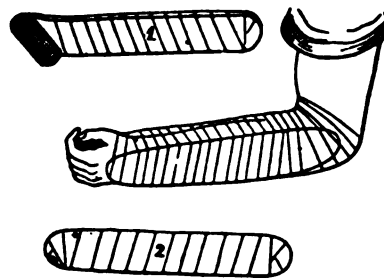
Fig. 217.—Splints, and their method of application in the treatment of fracture of the arm.

Treatment. The treatment of simple fracture of both bones of the fore-arm and cases attended with overlapping, without other complications, after adjustment of the displaced fragments, is to immobilize the fore-arm between two well padded splints, which should be light and a little wider than the arm, extending from near the elbow to the fingers and held in place with pieces of tape and a roller bandage. Provisions must be allowed for swelling that the circulation of blood through the injured parts may not be restricted by tight bandaging. Many surgeons prefer that the anterior splint only should reach to the fingers, while the posterior splint should not reach beyond the wrist; this is to allow more or less movements of the fingers,

hoping thereby to prevent in great measure inflammatory adhesions of tendons and other structures. Should the subsequent swelling interfere with the circulation after the adjustment of the dressing, that condition will be noted by the swelling and purple appearance of the ends of the fingers. The bandages should be loosened and the splints readjusted. All dressings should be removed from time to time that the progress of repair can be observed, and any angular deformity corrected that might appear. If no complications appear the fracture will be healed in a month; and during this time the arm should be flexed and supported in a sling suspended from the neck, midway between pronation and supination.

Complications will have to be treated as they arise. Compound and comminuted fractures will not admit of tight dressings on account of the subsequent swelling that usually follows this variety of injury. The injured limb usually does well dressed upon a single dorsal padded splint fixed at the elbow, and extension made at the hand with strips of adhesive plaster as advised in the treatment of Colles' fracture of the radius. Supported in this manner topical application of cooling and anodyne solutions can be applied for a week, or until the acute inflammatory action has subsided; and during this period the patient had better be put to bed and the arm supported on a pillow. After about ten days the arm can be dressed in any one of the efficient immobilizing dressings, the preference usually being given to the plaster-of-Paris cast, caution always being directed to maintaining the fore-arm midway between pronation and supination. Usually all dressings can be laid aside in four weeks, and following this period the injured parts should be massaged to loosen up any existing adhesions resulting from inflammatory action.

FRACTURE OF THE ULNA

Fractures of the ulna, as in other long bones, take place in the lower, middle, and upper third of the shaft of the bone, and through the upper and lower extremity. The olecranon process, situated at the extreme upper part of the bone, and thinly
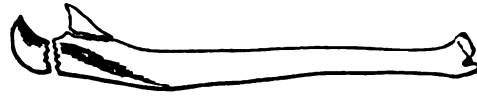
Fig. 218.—Fracture of the olecranon and coronoid processes.

covered by fascia and integument, is subject to fracture from falls upon the elbow, aided in many cases, perhaps, by forcible contractions of the triceps; this cause of fracture is prominent when the forearm is suddenly and forcibly extended from the
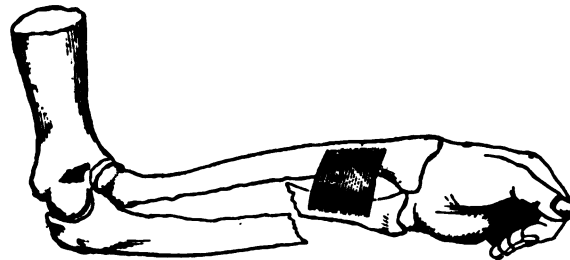
Fig. 219.—Fracture of the ulna above the origin of the pronator quadratus, showing the action of that muscle upon the lower fragment.

humerus. The tip of the process may be merely separated, or the line of fracture may cross the bone transversely through any point of the major body of the bony projection. Following complete fractures of the process, the broken fragment may be widely separated from the end of the ulna by the contraction of the triceps; the breach is widened through efforts of the patient to flex the arm at the elbow, which, if once accomplished, the forearm is again extended with difficulty.
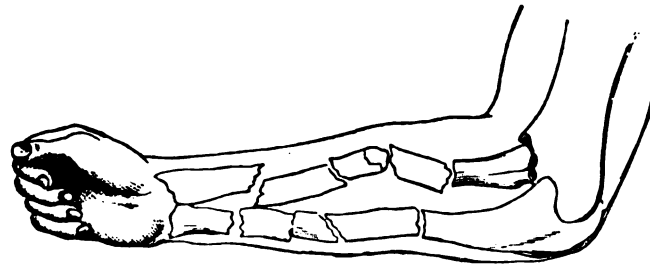
Fig. 220.—Comminuted fracture of both bones of the forearm. (*Howe.*)

Pain and swelling accompanied by displacement and the inability to use the forearm are the prominent symptoms presenting in this fracture. Crepitus can not be elicited in cases of great separation without forcibly bringing the fragments in contact, which is not always easily accomplished. The loss of the power of extending the forearm is a characteristic symptom of the injury. Force directed against the upper part of the radius and ulna sufficiently great to dislocate them has been known to produce a fracture also of the olecranon process.

The causes of the injury are direct violence, as a fall upon the point of the elbow; and indirect violence communicated to the process through the medium of the structures distal to the olecranon by falls upon the hand, and by muscular action.
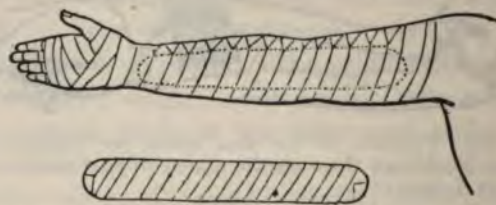
Fig. 221.—Method of treatment of fracture of the olecranon process.

Treatment: Treatment is directed towards bringing the fragments as near together as possible, and retaining them in position with some form of dressing, to prevent displacement. If the fragments are not displaced, or are held in position by the enveloping periosteum, separation may be prevented by applying a strip of adhesive plaster two inches wide and ten inches long along the posterior part of the arm, adjusting the upper end of the strip to the back part of the humerus for about five inches above the injury, and, while the arm is extended, traction is made on the strip toward the hand with the arm fully extended, while the lower half of the plaster is made secure to the posterior part of the forearm. The arm should then be dressed in the extended position. If the plaster strip is likely to glide upon the surface of the skin surface, a few turns of a roller bandage will serve to hold it in place during the period of treatment. If sufficient traction can not be secured by adjust-

ing the adhesive strip as directed above, it can be so adjusted that a suitable loop will be left over the fracture, through which a stick or pencil can be placed and made to twist like a windlass, taking up the slack in the plaster, thereby approximating the fractured fragments. An anterior splint is adjusted to the anterior part of the arm to maintain the extended position. The exception to dressing the arm in the extended position is where the fracturing force is of such a violent nature as to result in lasting injury to the joint; in this case the arm should be dressed in the semi-flexed position; a better use of the limb is thus obtained.

FRACTURE OF THE CARPAL BONES

Owing, perhaps, to the peculiar shape of the carpal bones, and their interrupted arrangement in the wrist, they seldom suffer fracture. Surgeons of extensive experience have seldom witnessed a fractured injury of this nature; they do occur, however, and cases of a compound nature have been reported resulting from direct violence of a crushing character, as the passage of a wheel of a heavily loaded wagon over the wrist, or having the hand caught between moving machinery. The scaphoid and the semilunar are the most liable to fracture, and in the order named.

The usual symptoms of fracture are manifest in such injuries of the carpal bones, viz,; pain, crepitus, deformity, and loss of function.

Treatment: The treatment consists in replacing the fragments, if deformity exists, and applying such fixation splints or cast as will immobilize the wrist during the period of repair, which will usually extend over three or four week's time. Compound injuries, if complicated with severe bruising of the soft parts, may require the soothing effect of antiphlogistic lotions for a few days previous to dressing the wrist in any form of fixation apparatus. The following lotion, when topically applied, reduces inflammatory and painful states.

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.....................$ ij.
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.....................$ vj.
...d painful parts every hour or

...he severely crushed and displaced, ampu-
...he resorted to, to save a long period of sup-
...tetanus, and perhaps loss of life.

FRACTURE OF THE METACARPAL BONES

Fracture of the metacarpal bones is not as frequently met with as might be expected from the great exposure of the hand to external violence. The injury is usually produced by direct violence received upon the back of the hand from a blow or fragments thrown from revolving machinery. If the injury results from indirect violence, it comes from a display of force against the knuckles as striking some hard object with the closed fist, or a fall upon the back of the hand, the fingers being flexed. Having the hand caught between the bumpers of moving cars, or other hard bodies, is a common cause of the fracture of these bones.

Fig. 222.—Fracture of three metacarpal bones, and first phalanx of the thumb. (Howe.)

The symptoms accompanying the fracture of the metacarpal bones are pain, crepitus, swelling from the bruising of the overlying soft parts, more or less deformity, depending upon the degree of displacement, and inability to use the hand. If the fracture is accompanied by severe bruising of the overlying struct-

ures, there is likely to be some degree of inflammation following the injury, and perhaps suppuration and sloughing.

Treatment. The object in the treatment of this injury is to restrain inflammation, adjust all displacements when they occur, and hold the fractured parts in apposition with some one of the efficient dressings for this form of injury, until the fractured ends have united. The most suitable appliance in common use is the long anterior padded splint with a roller bandage fastened to the distal end, which, when adjusted, will rest in the hollow of the palmar surface of the hand. This splint is held in place by running on a roller bandage, care being taken not to constrict the bruised and swollen tissues to the extent of interfering with the circulation, or to bind the fingers to the end of the splint. Where only two or more metacarpal bones are fractured, the others, remaining uninjured, act as splints to prevent shortening by overlapping of the fractured members. Inflammatory action can be held in restraint by cooling lotions topically applied.

FRACTURE OF THE PHALANGES

Fractures of the phalanges may be simple or compound, depending upon the nature of the fracturing force producing the injury. Direct and crushing violence is the most frequent cause of the injury, although force directed against the end of

Fig. 223.—Fracture of the second phalanx of the finger.

the fingers as by being hit by a swiftly thrown ball has resulted in fracture of some one of the shafts of one or more fingers. Comminuted fractures of the phalanges are seldom met with, and compound injuries result from crushing violence.

The symptoms of simple fracture of a shaft of a digit are pain, crepitus, and unnatural mobility of the injured finger. Com-

℞.
Tr. Opium ....℥ ij.
Carbonate ammonium ....℥ ij.
Chloroform water, q. s. ....℥ vj.
M. Sig.—Apply to inflamed and painful parts every hour or
two as may be indicated.

If the carpal bones be severely crushed and displaced, amputation may have to be resorted to, to save a long period of suppuration, gangrene, tetanus, and perhaps loss of life.

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pain, crepitus, and unnatural mobility of the injured finger. Com-

pound fractures have, as additional symptoms, a bruising and laceration of the soft parts, more or less swelling, and perhaps an exposure of the ends of the fractured shaft.

Treatment. A simple fracture of the digits is usually dressed upon a straight palmar splint, made of thin wood and extending well to the end of the fingers, with a surplus of padding near the end of the palmar side over which the fingers are adjusted in a slightly flexed position, and the hand and forearm bound in by a roller bandage. If no complications follow, the fracture will be united in three weeks· If displacement accompanies the injury, it is likely to be angular in character, and will usually create a prominence on the palmar side of the finger, which will always remain sensitive to pressure unless the deformity is overcome in the early part of the treatment by extension and fixation.

Should the fracture take place near the metacarpal articulation, to prevent angular deformity, the hand can be dressed to advantage over an oval compress or ball, placed in the palmar surface of the hand, and fixed in this position with a few turns of a bandage. If the soft structures be badly crushed, they should be dressed for a few days with antiseptic lotions; lysol or cresol being preferred.

FRACTURES OF THE BONES OF THE FOOT

Owing to the anatomical arrangement and nature of the bones of the foot, fractures are seldom produced by other than direct and crushing force. The shape of the os calcis with the attachment and display of powerful muscular force, and its peculiar formation in the ankle joint, as well as that of the astragalus, which receives the entire articular surface of the lower end of the tibia, render both bones liable to fracture by indirect forces. The crushing force producing fracture of the bones of the foot usually injures the adjacent soft parts to the extent that sloughing follows, converting what was at first a simple fracture into a compound fracture, with the liability of infection and a prolonged period of recovery.

Fracture of the Astragalus

The astragalus is frequently broken, as a result of falls from a height, the bone being forced against the calcaneum by the end of the tibia, the same force not infrequently fracturing the calcaneum and fibula and dislocating the ankle. The line of fracture will vary greatly in cases of this kind; it may be transverse, longitudinal, or horizontal, or oblique, or into several pieces, making it a comminuted fracture.

Unless marked displacement is present, a correct diagnosis may be obtained with difficulty, owing to the injury done to the surrounding soft parts.

The symptoms are often obscure; pain, swelling, and crepitus are the leading diagnostic features of the lesion. Inability to bear the weight of the body on the foot is a marked symptom, but not alone of fracture, as the same symptom is pronounced in severe injuries to the soft parts.

Treatment: In simple fractures of the astragalus without misplacement, the treatment consists in the application of some form of fixation splint or dressing that will thoroughly produce immobilization. A plaster-of-Paris dressing, snugly run on the foot and ankle, gives the best result, giving special attention to the position of the foot in relation to that of the leg; which should be at right angles with the latter, and without eversion or inversion. After the second week, the plaster dressing should be removed, and the injured parts massaged and passive movements executed, two or three times a day.

If the fracture proves to be comminuted and difficulty is experienced in adjusting the fragments of bone, incision should be resorted to and the disconnected pieces removed, after which the foot should be placed in an extension apparatus for three or four weeks, or until the injured parts have healed; following this with passive motion and massage, to prevent extensive ankylosis, if possible. In compound fractures of the astragalus, cases will present where the removal of the bone will be followed by better results than a more conservative treatment. Fractured injuries to the astragalus and other bones comprising the ankle joint, often result in such serious disorganization to joint and leg as to place the patient's life in jeopardy.

Fracture of the Os Calcis

The os calcis is frequently broken by falls upon the foot from a height, and contraction of the powerful muscles of the calf of the leg, which display their force through the tendon Achilles to the posterior end of the bone. The character and extent of the fracture will vary with the cause of the injury; the plantar fascia preventing in a great measure extensive separation of the fragments.

The anterior half of the bone usually suffers a crushed or splintered fracture in falls directly upon the sole of the foot. Seldom is the calcaneum fractured in its long diameter. Inability to place the weight of the body upon the foot, or to walk, is experienced as soon as the injury is received.

The diagnosis of simple fracture of the os calcis is not always as easy as might be supposed, the injury often being mistaken for fracture of the lower end of the fibula. The prominent symptoms attending a fracture of the bone are pain, swelling, crepitus, with greater or less deformity when displacement of the fragments are dependent upon muscular contraction. In rendering a diagnosis, it is well to flex the legs at the knees, thereby relieving muscular tension, when the injured foot can be compared with the well one.

Treatment: The treatment, in cases where no displacement is present, is immobilizing the foot in a plaster dressing and keeping it at rest for three weeks or more, after which time the injured parts should be massaged and gradual use of the foot renewed by attempts to walk. Wiring together of disengaged fragments in some cases of comminuted fracture of the bone has been successful, while others of a more serious nature require resection. Following the operative work in either case, the subsequent treatment will be the same as in simple fracture of the bone. Tenderness and limit of motion of the ankle joint will usually be a feature of the injury for some weeks following the removal of the fixation splints.

No other than a crushing force can produce a fracture of the other tarsal bones, and in such cases the overlying soft parts are so severely torn and lacerated that amputation is im-

perative to effect a cure, and shape the stump for an artificial foot.

Fracture of the Metatarsal Bones.

Owing to the exposed state of these bones they are frequently fractured as a result of direct violence, and often the adjacent soft parts are severely lacerated, complicating the fracture injury. There is no marked displacement present as a diagnostic feature, unless two or more of the bones are broken, and in such cases the tendency is for the ends of the fragments to be displaced toward the dorsum of the foot. In cases of fracture of one of the bones, the one next to it remaining intact serves as a splint to prevent displacement.

The local symptoms present, denoting fracture of one or more of these bones, are pain, swelling, crepitus upon motion, mobility, in some cases deformity, with more or less discoloration of the soft parts.

Favorable results may be expected from a simple fracture of one or two of the bones, if treated by the proper adjustment of a padded splint to the sole of the foot, and a moulded splint of felt or pasteboard applied to the leg, extending around the ankle and foot, over the padded splint, supported by the application of a roller bandage. In compound fractures, the surgeon must bear in mind the liability of infection, resulting in caries, necrosis, and abscess formation. Should such a complication present, the suppurative field must be freely opened up and cleared of necrotic tissue, and ample drainage provided for. The wound should be kept clean with a 1-5000 bichloride solution, or some other potent antiseptic wash.

Fracture of the Phalanges.

These bones more frequently suffer crushing injuries from heavy weights falling upon them than fractures from direct violence; however, when a fracture of the phalanges does occur, it is usually of the compound variety. The great toe more often suffers fracture than all the rest combined. The symptoms present in fracture of the toes are pain and swelling, with discoloration and crepitus. Mobility is sometimes elicited, but displacement is seldom a marked feature of the injury.

Treatment: The treatment of fracture of the digits should consist of a padded splint applied to the sole of the foot and extending beyond the toes a half inch or more, held in place with a roller bandage, and the foot placed at rest in a moderately elevated position. Should the injury be a compound fracture, with much contusion of the soft parts, cool, antiseptic lotions should be applied freely, until the acute inflammatory symptoms have subsided, following this with some efficient immobilizing splint or dressing that will hold the parts at rest till osseous union has taken place.

FRACTURE OF THE CORONOID PROCESS

Owing to the protection given to the coronoid process of the ulna by the other bones composing the elbow joint, the bony projection is seldom broken, and when it does occur, it is generally in connection with a dislocation of both bones of the forearm backward. The fracture can hardly take place as a result of muscular action, as the most powerful of the muscles attached to the bony process are inserted near its base, where force displayed can hardly cause its separation from the shaft of the ulna.

There are several instances on record where a fracture of the coronoid process occurred as a result of direct violence displayed against it and there is no reason to doubt but what a smart blow with a hammer, iron rod, or other hard object, as well as the passage of a wagon wheel, may cause the injury.

The symptoms characteristic of the injury are the displacement of the bones forming the elbow articulation and the presence of the separated process of bone resting somewhere near the end of the humerus and in front of the joint; the ease by which the dislocation is reduced, and the difficulty encountered in maintaining the bones of the joint in position once they are reduced. Muscular action displaces the tip of bone from the point of separation; hence, crepitation cannot be obtained, as a rule, except the dislocation is reduced and the forearm is forced into extreme flexion. When the fracture occurs from direct violence, the forearm held in extreme flexion while the

tip of the bone is pressed downward, may make it possible to elicit-crepitation between the process and shaft of the ulna.

Treatment: The treatment of fracture of the process from direct violence consists in placing the arm in a flexed position and maintaining it there by a plaster-of-Paris dressing, or other immobilizing apparatus, to hold it steadily while union is taking place. If the fracture is complicated by a dislocation of the bones of the forearm, they should at once be replaced by extension and rotation with the right hand, aided by the left in manipulating the ends of the bones at the joint. The arm is then flexed to the degree necessary to bring the fragments into apposition, where they are maintained with some form of immobilizing dressing, for about three weeks, when passive movements should be given the joint in connection with massage, to prevent ankylosis. A firm union of the fragments is, by no means, always obtained.

FRACTURE OF THE RIBS

Fracture of the ribs is of quite common occurrence, notwithstanding their ligamentous and elastic terminal connection, and their disposition to bend under external force displayed against them, and they spring back again into place. The ribs are much more yielding in the young than they are in individuals past middle life, as the bones become more brittle from the presence of an excess of earthy matter as age advances.

Kicks and blows are common causes of fracture of the ribs, although the accident has frequently occurred from crushing forces displayed against the ribs, also from violent sneezing.

The fourth, fifth, sixth and seventh ribs are perhaps more frequently broken from ordinary forces than are the others, the middle portion of the bone suffering the injury, although the fracture is very apt to take place at the point where direct force is applied as the toe of a boot or a blow from a hammer or other hard object.

One or more ribs may be broken at the same time, the number and displacement depending altogether upon the character of the violence displayed. If one rib only is broken, not much

displacement occurs, but if several are fractured, the violence displayed is likely to force the ends of the fragments through the pleura, if not into the lung. It is possible to break a rib and not severely injure the surrounding periosteum; in this case no displacement takes place, limited respiratory movements of the chest walls, with tenderness on pressure and sharp local twinges of pain, being the presenting diagnostic features of the accident. When the lung is punctured by the fractured fragments, the respiratory organ frequently collapses. or hemorrhage may follow from the lung or intercostal artery, and the injury may be complicated by emphysema and respiratory disturbances.

Fig. 224.—Fracture of the ribs, followed by spans of osseous reparative material extending between the bony structures. (*Howe.*)

Simple fracture of the ribs is not, as a rule, attended with serious symptoms, it is only after penetrating wounds of internal organs of the chest that grave conditions supervene.

The symptoms accompanying fracture of the ribs are generally definite and unmistakable. Their degree of severity will depend, of course, upon the extent of the injury. There is usually present more or less tenderness and local pain at the site of the injury, which is increased by pressure; coughing or sneezing also intensifies the pain. The patient prefers to lie on his back and he avoids taking deep respirations. Unless the fractured ends overlap, crepitus may be readily obtained by manipulating the broken portions of the rib, except in cases where the fracture has taken place far back, near the spinal articulation; here the necessary movements cannot be produced to create
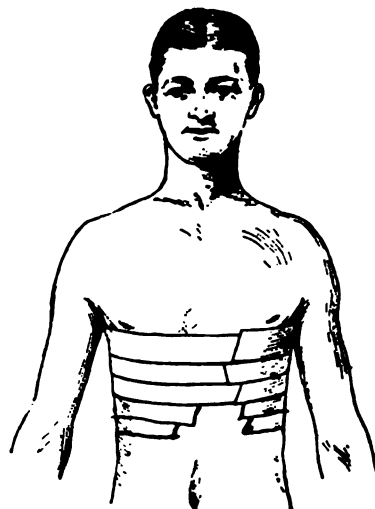
Fig. 225.—Adhesive plaster dressing for fracture ot the ribs.

crepitous sounds. Compound fractures of the ribs sometimes occur as a result of gunshot or crushing injuries. This form of injury is usually fraught with more or less danger, on account
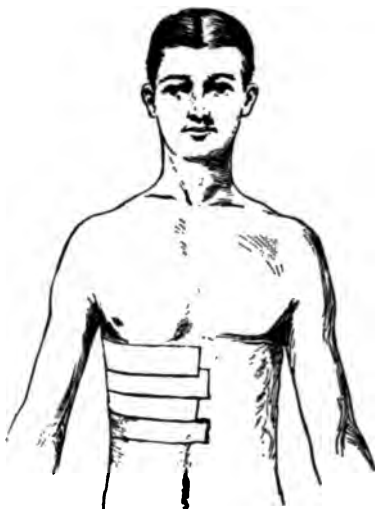
Fig. 226.—Adhesive plaster dressing extending half way round the body. for the treatment of injuries to the chest.

of injury to internal structures and the intercostal arteries that skirt along the lower internal border of the ribs.

Treatment: The treatment of fractures of the ribs without misplacement, consists in keeping the patient as quiet as possible, and limiting the respiratory movements of the chest-walls by applying strips of adhesive plaster snugly around the chest, overlapping the fractured ribs; or, in place of the adhesive strips, a folded towel or some other firm piece of cloth ten inches or more in width should be pinned around the chest, caution being observed not to adjust it so tightly that respiration will be seriously interfered with.
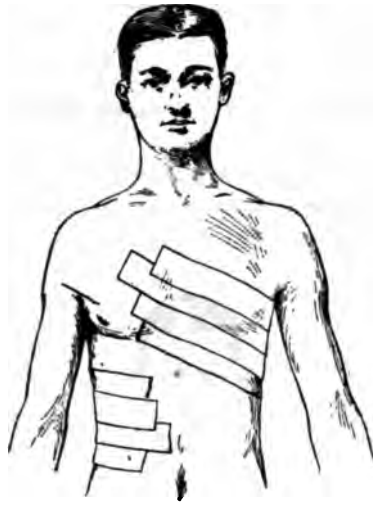
Fig. 227.—The character of some injuries to the chest may require the application of the adhesive strips diagonally around the body.

Occasionally a nervous patient will object to any form of dressing being applied to the chest immediately following the receipt of the fractured injury, on account of the dyspnea experienced; in such cases, the individual should be kept at rest in bed for a few days, and under the influence of heroin and belladonna, hypodermically administered, to control sharp twinges of pain, when needed; at a later date, the thorax may be strapped without discomfort.

Compound fractures, and others, with overlapping or depressed fragments, will require, first, an adjustment of the ends of the broken ribs, which may be so difficult to accomplish that the external wound will have to be enlarged, where one exists, or the broken ribs exposed through an open incision, and by the aid of a blunt hook, the ends are pulled up into place. If blood clots are found in the pleural cavity beneath the external wound, they should be scooped out, and drainage established for a few days, if needed. Bleeding vessels should be caught up with thumb forceps and ligated, and the wound cleaned of exuding fluids, and then closed with silk-wormgut sutures. The character of the fracture is sometimes such as to require wiring, in order to keep the ends in apposition. The straps of adhesive plaster or binder are adjusted about the thorax during expiration, if possible.

Empyemia, following fracture of the ribs, will require puncture of the outward walls of the chest with a large trocar and canula, which will afford ample drainage, while emphysema, if pronounced, should be relieved by puncturing the skin and superficial fascia about the wound with a sharp pointed bistoury, following with a compress and bandage.

Other complications should be treated as they arise. Fever is controlled with aconite or veratrum, pleurisy pain with bryonia and belladonna or gelsemium, and cough with the following mixture:

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Ŗ.
  Sulph. of Morphia ..............................gr. ij.
  Fl. Ext. Glycyrrhiza ........................3  j.
  Chloroform Water, q. s. ....................fl. Ʒ iv.
M. Sig.—Taken in half to one small teaspoonful doses.
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FRACTURE OF THE STERNUM

The sternum occupies a prominent position in the chest-walls, yet it is seldom broken. The accident is due either to direct violence or crushing injuries that often break one or more of the ribs at the same time. It has been the observation of surgeons of large experience that the bone is as often separated at the junction of the gladiolus with the manubrium as fracture'

occur through the bodies of these bones, and it is at or near this union that fractures commonly take place in individuals of adult or old age. Fractures of the bone are generally transverse, and vary in degree from a simple crack in the bone to a fracture with marked displacement.

Separation of the ensiform process from the gladiolus sometimes takes place, and longitudinal, compound, and comminuted fractures often occur as a result of gunshot wounds.

It is not impossible for fractures of the sternum to take place as a result of strenuous muscular action, and the same has been observed in athletes while attempting to do difficult stunts, and women while distorting the body during the throes of labor.

The symptoms noted by an individual suffering fracture of the breastbone are the audible snap sometimes heard by the patient, the sharp pain experienced at the seat of injury, which is intensified by taking deep respirations, irregular outline of the bone where there is overlapping or other forms of displacement; and crepitus, in some cases, if seen early, or before swelling and effusion take place.

Injury to underlying structures may give rise to more or less inflammatory action, hemorrhage, effusion of serum, suppuration, rigors, hectic fever, thirst and digestive disturbances; these conditions, when present, are considered complications, and should be treated according to the demands of the individual case.

Treatment: A simple fracture of the sternum will require the application of several strips of zinc oxide plaster an inch or more in width, across the seat of the injury, or a firm cloth binder, ten inches or more in width pinned around the chest; or, in place of the above, a plaster-of-Paris jacket may be adjusted to the thorax in such a manner that undue movements of the chest-walls at the seat of fracture will be restrained.

Before adjusting any form of dressing to the chest, in cases where there is overlapping of the fragments, the latter must be pulled into place, which is generally done while the body is bent far backward and swayed from side to side, while force is directed with the fingers against the prominent portions of

the bone, the patient being directed at the same time to take deep inspirations. In cases where the above treatment does not succeed, the patient should be placed under an anæsthetic; the bone exposed through a central incision, and the overlapping fragments are then forced into position with an elevator, if one is at hand, or a screw-driver utilized as such. A blunt hook can be used to advantage in some cases, and a large sized gimlet can be screwed into a depressed fragment and pulled into position while the patient's body is bent far backward.

POTT'S DISEASE OF THE SPINE

Tuberculosis of the spine, known as Pott's disease, is frequently observed in young children who are reared in squalor, are poorly nourished and are of a scrofulous diathesis.

The primary cause of the disease is an inflammation that

Fig. 228.—Necrosis of a spinal vertebra. (Howe.)

may be due to a strain, an embolism, or other injuries to one or more of the vertebral bodies.

When the morbid state of the spine makes its appearance later in life, its exciting cause is generally due to some severe constitutional taint, as syphilis and scrofula, or to some of the severe inflammatory affections, as rheumatism, osteo-arthritis, and osteitis. Whichever may be the primary cause, it is generally of so severe a nature that the continuity of structure is destroyed and caries or necrosis of the vertebræ results.
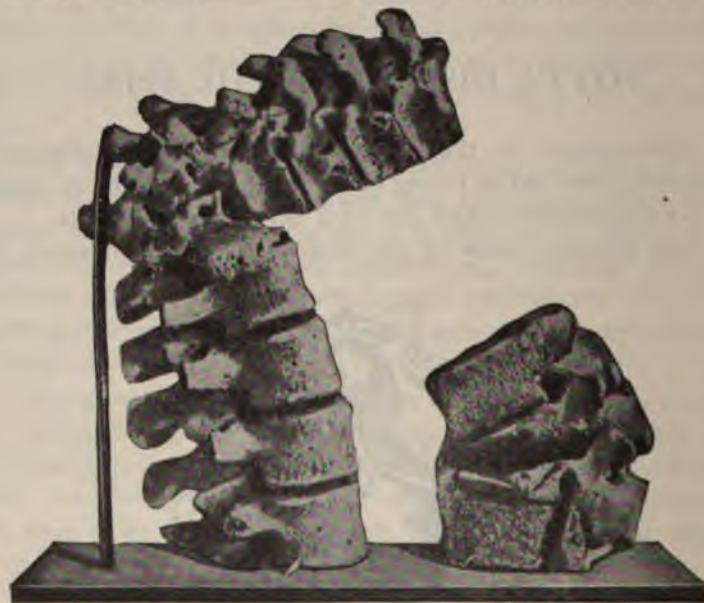
Fig. 229.—Absorption of the vertebral bodies, the result of necrosis of the spine. (*Young.*)

The seat of the disease is very likely to be in the vertebral bodies and extend from this structure to the fibro-cartilage that exists between these bodies through continuity of structure.

The anterior portion of the body of the vertebræ yields to the disintegrating process long before the other parts of the structure become involved, occasioned perhaps by a greater blood supply to this part of the bone, and the supra-incumbent weight of the upper part of the body resting upon these bodies. As the necrotic disease progresses, it finally involves the spin-

Fig. 230.—Deformity in Pott's disease of the spine.

ous and transverse processes adjacent to the affected vertebral bodies, which finally yield to the pressure from above and project backward, forming what is known as a kyphosis or angular curvature of the spine.

The lower dorsal and upper lumbar vertebræ are the most common seats of the disease, although the morbid condition may exist at any point in the vertebral column; those of the cervical region stand next in frequency, especially in adults.

Pott's disease of the vertebræ progresses slowly, as a rule, form its inception, covering over periods of months and even years, sometimes resulting in abscess formations, but not always. If, during the inflammatory stages, the infection germs find a foothold in the exudate, suppuration and rapid degeneration of the osseous tissues are sure to take place. In tubercular disease of the new inflammatory material, no pus is formed, unless there is mixed infection; streptococci or staphylococci must first invade the diseased area before suppuration becomes manifest. In other words, the bacilli of tuberculosis will destroy

the vertebræ and inflammatory exudate, but not by suppuration.

The deformity resulting from Pott's disease of the spine will depend upon the extent of the destruction to the vertebral bodies. If the necrotic process be slight and superficial, no deviation will result, especially if the disease be soon checked in its degenerative career, but a marked projection backward (kyphosis), always follows a collapse of the anterior portion of one or more vertebral bodies.

Fig. 231.—Lumbar, Pott's disease. (*Farnum.*)

If the necrotic degeneration of the atlas and axis is extensive, there is, through muscular action, a marked displacement forward, in some cases carrying the head far out of the normal position, which is strikingly observable when viewed from the side.

When the disease attacks the cervico-dorsal bodies and one or more of them give way under the necrotic process and pressure of the upper portion of the body, the deformity to the upper

part of the thorax is quite marked; the chin is frequently brought down upon the sternum and the movements of the neck are limited.

Respiration and the action of the heart are more or less crippled when the necrotic disease severely attacks the dorsal vertebræ a little lower down, causing great deformity of the thoracic walls.

Fig. 232.—Deformity of the bones of the thorax, resulting from Pott's disease of the vertebræ. (*Farnum.*)

It is fortunate for the patient if the nature of the disease be determined by the early symptoms of some evident wrong of the spine, which is usually made manifest by spasm of the spinal muscles and limit of motion, caused by the rigid spine. The patient generally complains of pain in the abdomen or thorax, which is increased by bending the body forward and alleviated by bending it slowly backward.

The patient walks with a careful gait, avoiding jars and sudden turning of the body, or even stooping to pick up objects from the floor, bending the knees and assuming a crouching position to enable him to reach it. As a rule there is but little

Fig. 233.—Pott's disease of the upper dorsal vertebræ. (*Farnum.*)

pain experienced in the seat of the disease, but the reflexes are more or less exaggerated. As time passes, another train of symptoms supervenes; deformity will gradually appear and with it paralysis of certain groups of muscles will become manifest,

from the deposit of tubercular matter and inflammatory products within the meninges of the cord and not always from impinging of the nervous structure, by the distortion of the disease vertebræ. If now the tuberculous area becomes infected with germs of purulency, the patient will soon experience rigors, hectic fever, thirst, malaise, loss of appetite, irregular action from the bowels, and anemic conditions, followed by night sweats and slow physical exhaustion.
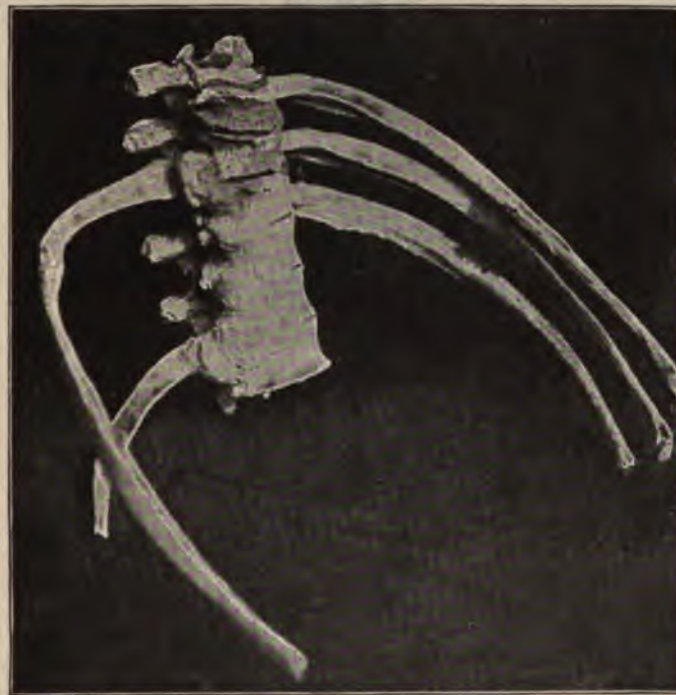
Fig. 234.—A specimen showing ankylosis of the vertebræ in Pott's disease. (*Farnum.*)

Treatment: The treatment of Pott's disease of the spine is usually successful, if the disease is recognized early and proper methods are adopted. It is an unpardonable mistake to look upon the disease as emanating from some constitutional taint, and place the patient under restraint and upon alteratives and tonics, without applying some form of mechanical device to pro-

duce extension to relieve pressure, and at the same time cause
absolute fixation to relieve injury from motion; such cases gen-
erally grow gradually worse, especially as regards the spinal
deformity, and are often past the period of a cure by the time the
case is placed in the hand of the surgeon; hence, it is very evi-
dent that a proper diagnosis should be made early, and suitable
appliance at once adjusted to relieve pressure and cause fixation.
Following this step, the general health should be maintained by

Fig. 235.—Iron brace and straps, for the treatment of
Pott's disease of the spine.

peptics and tonics and a rich nutritious diet with plenty of sun-
shine and fresh air.

There are various forms of appliances for the fixation and
support of a diseased spine, all having some features to commend
them under certain conditions. Some are made of bands of iron,
riveted together and adjusted to the body with elastic bands.
Others are made in the form of a corset, from plaster-of-Paris,
wood, paper, and aluminum; the former when properly moulded

to the body being preferred to any of the others. It should be
made from the best dental plaster, previously heated in an oven
to drive off retained moisture before rubbing it into the meshes of
gauze or crinoline, preparatory to applying it to the body, after
it has been wet in weak salt water, till air bubbles cease to
escape. The patient should put on a long, close-fitting gauze
vest or shirt, over which the plaster-of-Paris bandages are ap-

Fig. 236.—Spinal brace, for the treatment of diseases of the
dorsal spine. (*Farnum.*)

plied, which should be four to six inches in width. The external
surface of the vest should be slightly dampened with salt water
to insure the first turns of the plaster bandage adhering well.
The first bandage should be at least six inches wide and contain
plenty of the plaster in its meshes. Each succeeding bandage
should be quickly and smoothly run on while the child is sus-
pended by the arms by attendants, in spinal curvature; or while

lying upon a strip of canvas of suitable width, tightly stretched with slits in it for the face and arms to rest, while extension is made upon the arms and legs by assistants. As each bandage is applied, the surgeon rubs and moulds it to the shape of the body and to the preceding bandage.

The success in making the jacket depends largely upon the first bandage applied. The first three or four turns should be made just above the hips and then extend well up under the arms, because the corset, resting upon the hips and coming well

Fig. 237.—Apron for spinal brace.

up under the arms, the heft of the upper part of the body is relieved from pressing upon the diseased area.

As the plaster commences to set, the surgeon should grasp each side of the cast, with the hands just above the hips and press forward, while the assistant makes counter-pressure from the front, by pressing backward with the open hand against the upper portion of the cast, as shown in the cut

It will be well to place a folded napkin under the gauze vest over the stomach before running on the plaster bandages, to make room for distension of the stomach when eating; while

the cast is setting the pad should be removed, after which slight pressure should be made against the front of the cast, to shorten its anterio-posterior diameters and lessen any pressure against the spinous processes. The plaster corset should be cut down the median line in front, before it has thoroughly set, and the upper and lower edges trimmed with a sharp knife. The lower part of the cotton vest should be turned up over the cast and stitched to the same material at the top, if long enough, thus making a very snug cover to the cast.

Care should be taken not to make the cast too heavy; ordinarily four or five bandages, six yards long and five inches wide,

Fig. 238.—The illustration shows the several steps taken in the formation of a plaster cast.

will suffice to make a corset for a child six years old. A strip of rather heavy leather, provided with shoe-hook eyes two inches apart is sewed on either side of the opening in front of the cast, that it may be laced like a corset after it is adjusted to the body.

A finished plaster corset for a child six years old should not weigh more than one and a half pounds, while that for an adult should not exceed three pounds. This form of cast then provides a support that is as light as any make of steel braces made for a like purpose. To reiterate what has been said before, a sup-

port, to be effective, is one that will give extension to the spine, and, at the same time, relieve pressure and when properly made, there is anterior-posterior support, transmitting the weight of the body through the transverse and articular processes, thereby relieving the bodies of the diseased vertebræ.

Fig. 239.—Plaster-of-Paris jacket for spinal disease. (*Farnum.*)

The aluminum corset is light and can be worn with comfort and should be substituted for the plaster cast as soon as the disease of the vertebral bodies and the curvature has been arrested. It should be worn for a long time or until the weakness of the spine has been recovered from.

A plaster cast cannot be worn by a child under three and a half years of age, on account of the smallness of the hips,

which fail to give the support required in such cases. To properly treat curvature of the spine in young children, they should be put in a portable bed, made of plaster-of-Paris, made after the models represented in the cut shown in the article on the treatment of fracture of the vertebræ.

Operative procedures for the relief of paralysis, one of the most serious features of Pott's disease of the spine, should be considered if favorable results are not obtained within a reason-

Fig. 240.—A convenient position for the patient to assume while applying a plaster-of-Paris cast on children five years and upwards.

able time from the wearing of the plaster corset. The diseased area is approached through a median incision made over the prominent part of the backward projection, cutting down at once upon the spinous processes, the tips of which are next severed, leaving the muscular attachments intact. The spines are next removed and the meninges of the cord approached and examined for tuberculous deposit, which if found is removed through an opening in the external coverings of the cord, with a small scoop, care being taken not to injure the cord during the procedure. The opening should be made large enough to

insure the removal of every vestige of the caseous matter. Following the operation, the muscular structures should be properly adjusted and the external wound closed, with or without drainage as the case will suggest.

If an abscess exists in or near the diseased area it should be opened and the purulent fluid evacuated and a rubber drainage

Fig. 241.—Jury mast attached to a plaster-of-Paris jacket, utilized in the treatment of cervical Pott's disease. (*Farnum.*)

tube inserted. After thoroughly washing out the cavity with the alkaline or bichloride solution 1-3000, this should be followed with an injection into the cavernous area of a mixture of iodoform, four drachms to glycerine, four ounces. During recovery, the weakened spine should have the support of a plaster jacket or some one of the other supports previously mentioned in this article.

As previously stated, only cases that other means fail to benefit or cure should be operated on, and of this class of cases many would die or recover hopelessly crippled without operation, and if fifty per cent can be benefited through operative procedures, the surgeon is justified in assuming the risk in performing the work.

PERIOSTITIS

Periostitis is an inflammation of the enveloping membrane of bones.

The cause of the morbid state is often obscure, but the acute form, which is one of the subdivisions into which the disease is divided, is generally due to injuries and to exposure to the extremes of heat or cold. It occurs more frequently in children and young adults than in middle or old age, due perhaps to the highly vascular state of the membrane in rapidly growing periods of life. The affection is usually observed in the long bones, but fortunately it is not of frequent occurrence: it may be independent of an inflammatory state of the osseous structure beneath. Extreme cases of acute periostitis often lead to suppuration and necrosis of the bone. In arthritis of a severe degree, both the periosteum and the osseous structure become highly inflamed and extremely sensitive to weight and pressure.

Periostitis, which becomes chronic in character, may be due to injuries, but is more likely to be the result of some constitutional taint, of which syphilis figures as the most common factor. When it is the result of the former cause, the morbid condition is always local, but several parts of the skeleton may be attacked at the same time when the disease is due to syphilis or other general disorders.

The early symptoms accompanying the periosteal disease are sudden and acute pain, fever, swelling of the tissues, tenderness on pressure; the tissues after a few days become edematous and redness of the skin is observed at about the same time.

The pain is usually of a boring character, and is generally worse at night. The fever often runs high and is hectic in character in all cases where suppuration follows the inflammatory action.

The tibia is frequently the seat of periostitis and it is not uncommon to discover hard lumps or nodes in the inflamed area which are due to an effusion of plastic lymph beneath the periosteum, elevating the latter from the surface of the bone beneath. Unless the condition of the system is markedly depleted by disease the deposits of plastic lymph will, in time, be transformed into osseous-like tissue, that becomes securely attached to the surface of the bone, if the soft tissues are not incised and the plastic fluid turned out. If the system is impoverished, the effused fluid is likely to break down into a suppurative mass that soon attacks the osseous structure, causing caries or necrosis of the same.

While periostitis is a serious affection in its worst phases, a cure may be brought about in the early stages of the disease, before destruction of the osseous structure has taken place, by judicious and timely treatment. But, unfortunately, the affection is not brought to the attention of the surgeon until it has made serious inroads upon the osseous structure as well as the periosteum; and it is not uncommon for pyemic or septicemic conditions of the system to follow the breaking down of the parts involved in the diseased area, especially in weakly persons having but little resisting power against suppuration and infection.

Treatment: The treatment of acute periostitis is principally local, and should be by medical and surgical measures. The patient should be kept at rest in bed with the foot and leg elevated, when it is these parts that are involved, and either wet heat or cold applied to the affected area, as is best suited to the individual case. Persons of feeble constitution will stand heat much better than they will cold, and on the other hand those of a plethoric state of body will make better progress from the application of cold. Tincture of iodine painted over the inflamed and painful area will do some good in the early stages of the affection, as will acidulated saline solution kept constantly applied. This is prepared by adding an ounce of salt, and a pint of vinegar to a quart of water, which can be applied hot or cold, as required. Feverish states may be relieved with the following mixture:

℞.
    Spc. Tr. Veratrum Viride ....gtt. xv.
    Spc. Tr. Echinacea .....-........................3 ij.
    Aqua, q. s. ....fl. 3 iv.
  M. Sig.—A teaspoonful every hour or two as may be needed.

The bowels should be kept open with the saline laxatives and the action of the kidneys free, with the acetate or citrate of potash.

If the periosteal inflammation be due to a syphilitic taint, iodide of potassium in large doses should be given two or three times a day. In chronic cases, the following mixture will be found most useful.

℞.
    Iodide of Potassium ....3 ij.
    Syrup of Trifolium Comp. ....fl. 3 vj.
  M. Sig.—A teaspoonful every three to four hours during the
    day.

For the tearing pains usually experienced in periostitis, temporary relief can be obtained from an occasional dose of chloral given in syrup, or, what is better, one-sixth or one-eighth grain of heroin administered hypodermically near the painful area once or twice during the twenty-four hours, will insure sleep and repose.

As soon as effusion of plastic lymph is suspected beneath the periosteum, a rather free incision in the overlying soft parts, including the periosteum, should be resorted to at once; this procedure will give permanent relief to the painful state.

In chronic cases, with abscess formations, in connection with the evacuation of pus and other fluids, the necrotic osseous structure should be curetted away, the cavity drained with iodoform gauze, with antiseptic after treatment strictly followed. The general health of the patient should be improved with appropriate doses of acid solution of iron, arsenic, phosphorus, the lime salts, with a nutritious diet in addition.

Syphilitic nodes, when present under the periosteum of the long bones, should not be mistaken for effusions of lymph, and an attempt made to incise the presenting tumor. They may be made to disappear within a reasonable period of time by the internal use of potassium iodide and the tincture of phytolacca, berberis, and trifolium given in alternation, and the local use

of iodine ointment. If the tissues are much swollen or edemat-
ous, a flannel bandage should be run on the limb on arising
from bed.

OSTEOTOMY

To correct the deformity of bow-legs, and in the shafts of
other long bones, due to inflammatory and systemic diseases,
the osseous structure is often cut into to such an extent that
the bone may be forced back into its normal position. The
operation is often done to correct the crippled condition of the
legs, caused by aggravated cases of knock-knees and anky-
losed joints.

The implements required to execute the work are scalpels,
scissors, retractors, hemostats, Esmarch's bandage and rubber
cord, dissecting forceps, chisel and mallet, curved needles and
needle holder, catgut for suture and ligatures, and Gigli's wire
saw.

Previous to commencing the operative work, the surface
of the skin should be rendered aseptic in the usual way. After
the patient has been anæsthetized, the soft parts overlying the
point where the bone is to be divided, are laid open by a longi-
tudinal incision to the desired length. Retract the margins of
the wound, exposing the bone, which may be partly divided with
the chisel or wire saw, completing the work by forcibly fractur-
ing the undivided portion of the bone, ligating all bleeding
points, cleansing the wound and uniting its margins with catgut;
no drainage needed, as a rule. The leg is held in the corrected
position, while padded splints or a plaster cast is adjusted. The
after-treatment will be the same as that for compound frac-
tures.

The patient should be kept at rest on a hair or other suit-
able mattress three or four weeks, depending upon the location
and extent of the traumatism. The operator must use due
care not to sever important vessels and nerves, and to prevent
infection, by observing strict antiseptic precautions.

OSTEOMALACIA

Osteomalacia is a term signifying a softening of the bones, due to a loss of the lime salts to such an extent that they bend under a moderate amount of weight or force displayed upon them. It is a disease incident to middle age, being rare in early life and old persons.

The outset of the morbid condition is devoid of such symptoms as would indicate the nature of the malady. For some reason, difficult to explain, women who are pregnant and those who have borne many children, seem to suffer most frequently from the disease. The reason assigned for this is supposed to be a deprivation of the necessary constituents of the osseous structures of the mother, caused by a certain amount of nourishment going to the fœtus in utero and the nursing of a child over a long period of time. It is observed among the poorer classes and those deprived of good food, fresh air, and at the same time exposed to great hardship. While the bones are deficient in the lime salts, the fluids of the body, especially the blood and urine, contain an excess of the calcium deposits.

Among the early symptoms of the morbid state, nervousness and deep rheumatic pains are the most prominent, which in most cases, are worse at night.

The pelvic bones, vertebral column, and ribs, usually first show evidence of the disease, and often become distorted as the disease advances. If fractures occur, the union of the fragments is slow, if at all, and as a result, false joints are not uncommon.

Treatment: The treatment should be both supportive and stimulating. The lime salts are especially indicated, and can be combined with some one of the potent alteratives. The following mixture is of great value in most cases.

R.
Fowler's solution ....℥ j.
Syrup lacto-phosphate of lime. q. s. ....fl. ℥ iv.
M. Sig.—A teaspoonful one hour after meals.

The acid solution of iron in two drop doses, in water every three hours is usually admissible in anæmic states, and the tinc-

ture of phosphorus will prove an efficient remedy in physical conditions marked by extreme exhaustion.

The patient should have eggs, beef and milk in liberal quantities, and should be urged to take the necessary exercise in the open air, and a daily bath in salt water.

OSTEITIS

Osteitis is an inflammation of bone tissue, and may result from exposure to extreme cold, rheumatic affections, syphilis, tubercular disease and traumatism. The morbid condition seldom exists as a primary affection, but is generally associated with an inflamed state of the periosteum (periostitis), endostitis exists in both the acute and chronic forms. The acute form sometimes follows amputation and other operations on the bones and gunshot and fractured injuries. The chronic form may be an extension of the acute attack, but is often the result of the worst phase of systemic disease. Either form of the disease is likely to break down in suppuration, especially if the inflamed area becomes invaded with septic germs.

This disease may attack any part of the skeleton. When due to a scrofulous condition of the body, the spongy bones and the articular ends of the larger bones are most liable to attacks. The shafts of the long bones are prone to break down under the degenerative effect of syphilitic invasion of the system. The osseous structure not infrequently increases in size and soon becomes very dense. The medullary space often becomes obliterated by inflammatory products. It is no uncommon occurrence for the inflammatory action in the medullary cavity to eventuate in abscess formation, this condition being at the same time associated with caries or necrosis of the bony structure; the abscess formation may be either circumscribed or diffused.

In one form of the inflammatory disease, described as osteitis deformans, the shafts of the long bones become the seat of the morbid action, rendering them thick, but pliable, and through muscular action they become in a measure distorted. The bones of the lower extremities are the most liable to at-

tacks of the disease, the vertebral column next in order, then the upper extremities and skull; the latter often assumes proportions several times its normal thickness, with uneven and roughened external surface.

Fig. 242.—Osteitis of wrist joint. (*Farnum.*)

In the early stages of the disease, deep-seated pains and tenderness on pressure seem to be the most prominent symptoms, the deformity, especially in the lower limbs, resulting from bearing the weight of the body as well as from muscular action.

The symptoms accompanying well marked cases of osteitis are rheumatic in character, the paroxysmal pain being deep-seated and acute in some cases, dull and aching in others. Dull headache is nearly always complained of when the skull becomes the seat of disease in certain cases, while the pain in others is decidedly neuralgic, caused by pressure of the inflammatory deposits.

The patient complains of tenderness of the bones on deep pressure, and the limbs seem stiff when making attempts to move them.

In many cases of osteitis deformans, the lower limbs become bowed and the spine curved backward, and generally assumes more or less of a rigid state, due to spasm of muscle and the inflammatory changes present in the osseous structure. The articular ends of the bones of the legs are seldom involved in the inflammatory disease, and if fracture occurs in the shafts of the bones, they unite with but little trouble.

Treatment: In the treatment of osteitis, the morbid state is to be managed according to existing conditions. Cases due

to syphilis will do well on antisyphilitic remedies, such as the vegetable alteratives, the lime salts and the several preparations of the iodides, together with good food, and an outdoor life. The action of the bowels and kidneys should be kept at a normal standard by a free use of saline laxatives and potent mineral waters. The above line of treatment will be found efficient in most cases, when due to tubercular and other low forms of systemic disease, with perhaps the addition of phosphorus, and arsenic in marked anæmic states. Iron, if indicated, will be found a potent remedy in the chronic form of the disease, as well as many of the stimulating compounds into which it enters.

In the early stages of the disease, the affected part should be kept at rest, and, if possible, placed in an elevated position. If pain is acute, and tenderness a feature, hot fomentations ap-
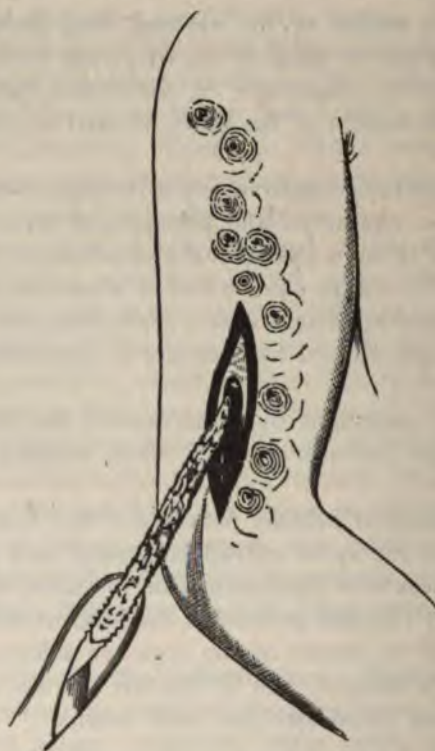
Fig. 243.—Removing a sequestrum of bone from a necrotic humerus. (*Howe.*)

plied for a time may bring quick relief. The tincture of iodine painted over the painful area will prove of much benefit in subacute and chronic cases. In cases where the periosteum is involved and a quantity of inflammatory exudate finds lodgment beneath this dense membrane, no treatment will bring lasting relief except incising the periosteum with a narrow-bladed bistoury, allowing the extravasated fluid to escape. If it is suspected that pus fills the medullary cavity, the bone should be drilled through the incision made in the overlying soft parts, and if the necrotic state of the osseous structure indicates the presence of a sequestrum, a longitudinal piece of bone should be cut away and the morbid structure sought for and, if found, removed.

To give rest and promote sleep in the worst phases of the disease, an occasional dose of chloral may be given, or, a one-sixth grain of heroin administered hypodermically. A flannel bandage run on snugly will prove comforting when the overlying soft structures are puffy or edematous from infiltration of effused fluids.

The treatment of osteitis deformans will be along the lines adopted in the treatment of arthritis, and such operative and mechanical measures adopted as the condition of the individual case will demand.

NECROSIS

The term necrosis, as applied to bone diseases, signifies death of a part or whole of the osseous structure. The degenerating process is often spoken of as dry gangrene of the bone.

The process is one of the sequelæ of inflammation of osseous structures and may exist in the acute or chronic form.

The morbid state is generally due to either traumatism or some form of serious systemic ailments; diabetic diseases being the most common. In extensive destruction of the osseous structure by necrosis, the diseased or dead portion may be observed resting in the soft structures, separated entirely from the adjacent bone structure of which it once formed an integral part; in such cases the dead bone remains in the system as a

foreign body. The line of separation or demarcation between the dead and living bone tissue is well outlined in nearly every case.

Necrosis is prone to attack the shafts of the long bones, the medullary canal being a common point of commencement. As the osseous tissue gives away under the disintegrating process, new energy is imparted to the periosteal
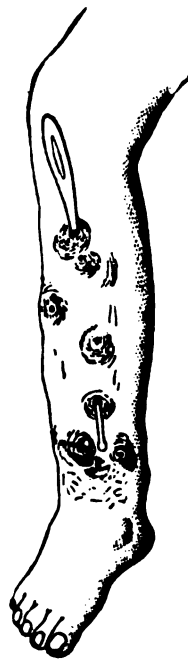
Fig. 244.—Necrosis of the tibia and resulting sinuses.

covering, which is displayed along the line of conservation of the remaining healthy bone tissue.

Treatment: The treatment of necrosis of bone is supportive and surgical. The systemic condition of the patient should be improved with blood purifiers, tonics, and stimulants. Among the remedies thought of in this connection are arsenic, iron, the calcium salts, and quinia and strychnia, when indicated.

The patient should have rich, nourishing food, such as mutton, chicken, and beef broth, oysters in season, with catsup and relishes, eggs, boiled ham, pickled tongue and pig's feet, and rich milk, ice cream, coarse breads with a little wine, beer or lemonade, if desired.
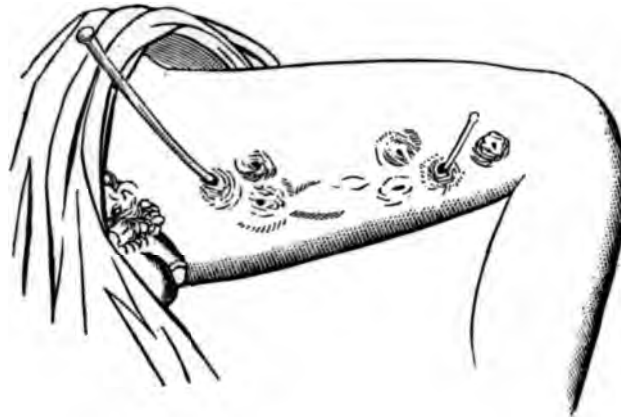
Fig. 245.—Necrosis of the femur with suppurating sinuses.

If it is thought best to cut down upon the diseased area and curette or otherwise remove the dead bone, the patient should be prepared for the work in the usual way, anæsthetized, the overlying soft structures divided, and after the bleeding points have been picked up and secured by ligature, the necrotic osseous tissue should then be removed with bone forceps, bone gouges, chisels or curette; the wound is then cleaned and closed in the usual way, with or without drainage, as the individual case will suggest.

HIP DISEASE—MORBUS COXARIUS

Crippled states of the legs resulting from hip-joint disease are so commonly met with that writers on surgical topics have, of late years, written exhaustively on the morbid condition. Hip disease proper is usually due to traumatic influences; however, rheumatism, gout, syphilis, and inflammatory diseases of the

central nervous system result in pathological lesions that simulate true hip disease in some marked features.

The symptoms attending hip-joint disease may be divided into two stages, the primary or stage of inflammation, and the

Fig. 246.—Position usually assumed in acute arthritis of the hip-joint. (*Farnum.*)

secondary or the stage of effusion and distension from inflammatory deposits. Clinical observations have determined the fact that inflammation of joints, either intra or extra capsular, causes a condition of rigidity or spasm of muscles that is characteristic of articular inflammations in general, that of the spine in

particular. This is due to irritation of nerve filaments, extending into the inflamed area, and transmitted through the reflexes. Muscles thus acted upon assume a state of spasm, which become atrophied later on from a disturbance of nutrition. Inflammation of the knee joint usually furnishes marked examples of the morbid conditions above alluded to. Rigidity of muscles, resulting from spasm, producing limit of motion, is an early symptom in any joint disease, and, as a natural result, the limit of motion produces some degree of deformity, and the deformity produces a limp; from these deductions a train of symptoms will be observed attending hip and other joint diseases; heat, pain and swelling, limit of motion, pain on joint pressure, spasm of muscles, atrophy and deformity, any two or three of which will be present in every case.   .

Pain is not always present in hip-joint disease, and the rise of temperature may be so slight that it is hardly perceptible; swelling, when present, is the result of effusion or dislocation, and pain on joint pressure is present only when the disease is within the capsular ligament, and near the articular surfaces. At least four of the characteristic symptoms mentioned above are usually observed in the same case; these are limited motion, spasm of muscle, a limping gait and deformity, and, as an associated condition, there is frequently marked lengthening or shortening of the limb. Atrophy is a common symptom and may take place early in the disease. Other common symptoms attending the morbid state are pain in and about the knee, piercing night cries, and marked flattening of the buttock.

During the acute stage of the disease, when the muscles about the joint are rigid with spasm, the patient objects to being jostled or moved about, or even to having the bed jarred; they will assume an easy position in bed and remain quietly for hours without asking to be moved, and then will fuss and complain in advance, knowing that a change of attitude will inflict distress.

During the latter part of the second or inflammatory stage, the morbid state lapses into ulceration, suppuration and distension, and finally perforation or rupture of the capsular ligament, giving vent to the purulent ·fluid into the surrounding

tissues, which, in time, if not evaucated through operative measures, will find its way to the surface through suppurating sinuses.

Fig. 247.—Front view of a case of hip-joint disease. Shortening from the tilting of the pelvis, the result of acute arthritis. (*Farnum.*)

Following the evacuation of the capsular fluid, the limb usually assumes a position quite the opposite from that previously taken.

The position of the limb is now one of adduction, and rotated inward, instead of abducted and everted, as it was during the

Fig. 248.—Back view of the same case (Fig. 247).

inflammatory stage. A feature of the now existing deformities is the abnormal elevation of the hip on the affected side, resulting from inflammatory contraction of the adjacent muscles,

and a twist in the pelvis caused by the abnormal position of the limb.

Before passing to the treatment of morbus coxarius, or hip-joint disease, it might be well to call attention to two morbid conditions from which it requires a keen differential diagnosis to exclude either from hip disease. Reference is made to Pott's disease of the lumbar spine, and hysterical affections of the hip-joint and lower spine. To determine the latter affection, close observation of the patient will detect him unconsciously assuming positions that he could not take were he suffering with true hip-joint disease; and, under anæsthesia, the absence of the prominent symptoms of the disease can readily be determined. From Pott's disease of the lumbar region the differential diagnosis is not so easily made, as there are symptoms in common to both morbid states, especially that of spasm of the psoas muscle; however, there will be noted the absence of muscular rigidity of the spine, abscess formations, and the usual deformity attending Pott's disease.

When both hip-joints are affected, the course of the disease differs somewhat, as both joints are seldom attacked at the same time; and the second joint may be attacked while the patient is at rest, being treated for the first attack, or the morbid action may appear after the patient has partially recovered from the attack of the first joint, and is able to be up and about.

The general health is but little impaired during the early phases of the disease, and the physical appearance little indicates the intense suffering the patient endures. There is a disposition to avoid exercise, the appetite is capricious, and digestion is enfeebled. One of the most marked symptoms noted at this time, however, is the irritable disposition present in the majority of cases. Later along, if the disease goes on to suppuration, chills and fever ensue, and the general health becomes otherwise impaired.

Treatment: The treatment of hip-joint disease is by both operative and mechanical measures, and varies with the stage of the individual case presented for cure. During the early stages of the disease, when the inflammatory action is acute, efforts should be made to stay the morbid action by enjoining rest, making exten-

sion, and applying cooling and anodyne mixtures topically to the inflamed and sensative parts. The patient should rest on a hair mattress, and the extension is made by applying strips of adhesive plaster about two inches wide on each side of the leg, extending to the knee, and left loose enough across the sole of the foot to form a loop, through which a strand may be passed and fastened to the foot of the bed, which should be elevated to the height of eight to twelve inches by placing bricks or blocks of wood beneath the posts of the foot-board.

Fig. 249.—A traction splint, useful in the treatment of hip-joint disease. A built-up shoe is worn on the well foot, and the patient gets about on crutches.

Efficient evaporating lotions, highly commended for topical application to the inflamed joint, are the following:

℞.
Menthol crystals ....℥ ss.
Mur. of ammonia ....℥ iv.
Alcohol ....℥ j.
Aqua dest., q. s. ....fl. ℥ viij

M. Sig.—Sop on inflamed parts every three hours.

R.
Carbonate of potash .... ℥ j.
Tr. of aconite .... ℨ j.
Tr. of opium .... ℥ vj.
Aqua dest., q.s. .... fl. o. j.
M. Sig.—Apply to painful parts every two or three hours.

If the morbid phases of the disease are not relieved within a reasonable time by this form of treatment, and the disease

Fig. 250.—A side view of an immobilizing splint, for thorough fixation of the hip in morbus coxarius.

goes on to suppuration, the pus is evacuated by incision, and the joint explored with the finger to determine the nature and extent of the destructive process. If the head or any part of the end of the bone has been separated by the necrotic process, it must be removed and all diseased tissue curetted away, and the

cavity thoroughly irrigated with bichloride solution, one to two
thousand in strength; following the irrigation, the cavity should
be filled with a ten per cent solution of iodoform in hot glycerine,
the patient put to bed and extension applied as before directed,
with the leg in the proper position; the leg may have to be
placed in an elevated attitude at first, but it may be gradually
brought down by lowering it a little each day until it assumes
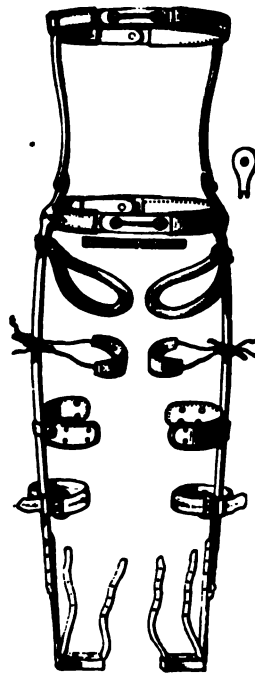
Fig. 251.—Double dispensary splint, for fixation of double
hip-joint disease.

a line on a level with the body. Now that the deformity is over-
come, apply a lateral traction splint that extends from one or
two padded belts around the body, one perhaps as high as the
arm-pits, to the foot, which is made fast to the foot-plate by
buckled straps, with additional fastenings of a like nature to ad-
just above and below the knee. In some cases, contracted mus-
cles, tendons and fascia will have to be incised before any other
applied method will overcome the deformity, and to insure suc-

cess by the mechanical appliances, be sure that the deformity is overcome and pus pockets opened first, and given special attention until the suppurating area has healed.

Fig. 252.—Bony ankylosis, and deformity following hip-joint disease. (*Farnum.*)

The patient will be required to wear the lateral traction and fixation splint from two to three years, and, in aggravated cases, for a still longer period, before a cure is established. While the fixation splint is presumed to overcome all motion

in the hip-joint during the period that it is worn, yet it is seldom that ankylosis results except in cases of extensive bone destruction. In the latter period of convalescence the patient is permitted to go about on crutches, which will act as a means of support, while the sound limb is to be raised by wearing a shoe with a raised sole or **patten** beneath it. This method will admit

Fig. 253.—The cut shows a shoe with a thick sole, to be worn during the period of convalescence.

of the injured limb swinging clear from the floor while moving about. Instrument makers have on display several styles of traction splints designed to make extension, and overcome deformity, but it is doubtful if there are any that excel the Phelps' combination traction and fixation appliance in practical points and for excellent results obtained from its use.

Patients suffering from hip-joint disease are often in a feeble state of body, and will require a constitutional treatment of an alterative and tonic character. For the cachectic state,

Fig. 254.—Range of motion in a case of hip-joint disease, after fixation for over a year.

the mineral acids, minute doses of quinia, and Fowler's solution of arsenic, singly or in combination with the elixir of the glycerophosphate of lime and soda, will stimulate the vital forces and whip up a lagging appetite. Sulphide of calcium in small doses

is also an efficient medicinal agent in these suppurative cases, as is iodide of iron. Quinine should always be given in the absence of fever, and the iron and arsenic mixtures after meals, that they may become mixed with the food while it is undergoing digestion. While the above remedies are efficient when given under specific indications, care must be exercised in their administration during the inflammatory stage of the disease; here specific tincture of veratrum viride will prove both a febrifuge and a tonic.

The food should be both nourishing and stimulating; game, meats, fish, eggs, and rich soups are permitted, as well as milk, cream, ice cream, and fruit jellies. Pickled pigs feet and meat jellies are often taken with a keen relish.

ANKYLOSIS OF JOINTS

Ankylosis has reference to loss of function of joints, which results from inflammatory action upon the structures composing or surrounding the articulations. The abnormal state is divided into four distinct varieties, as regards the structures affected, viz.—true ankylosis, where the connecting material is purely osseous matter, false ankylosis, caused by rigidity of the surrounding parts; extracapsular, like false ankylosis, results from a rigidity of parts outside of the joint, and intracapsular ankylosis caused by the morbid state of the structures within the capsular ligament and joint. Disuse of a joint following traumatic injuries inviting adhesion and contractions of muscles and tendons nearly always result in that phase of the morbid condition called false ankylosis. This form of ankylosis is the one most commonly met with, following injuries in and near the joints and if properly treated by massage and passive motion, within a reasonable time following the plastic adhesions of the soft parts, good results will usually follow.

Treatment: In true or bony ankylosis, all motion in the joint is lost and all efforts to re-establish movement by any kind of force should be abandoned. If seen early, the limb should be placed in such a position as to be of the most service to the patient and immobilized by a plaster-of-Paris, or other suitable

dressing that may be at hand, that will accomplish the desired end.

If the knee joint becomes ankylosed in a markedly flexed state before the surgeon is consulted, nothing short of operative measures upon the bone can give any measure of relief. In this phase of the deformity, the leg may be rendered useful to a marked degree by fracturing the femur a few inches above the articulation, which can be accomplished by a chisel and mallet through an incision carried down to the bone on the outside of the thigh, or a wedge-shaped piece of bone can be removed from the anterior part of the femur at the desired portion of the thigh, the remaining portion of the bone broken to the extent that the entire leg may be straightened as near as possible, after which the traumatism should be treated as a compound fracture.

The operative work, whether manipulative or instrumental, should be done while the patient is under an anæsthetic, following which, the limb should be fixed in a plaster-of-Paris cast, which should be retained until the fractured bone has fully united.

To overcome the morbid condition of the contracted muscles and tendons rendered useless by adhesive inflammation, electricity, counter irritation, heat, both dry and wet, have been faithfully tried, but with little lasting benefit. The prognosis should always be guarded in ankylosis of joints in syphilitic, septic and tuberculous patients.

Ankylosis of the lower jaw is sometimes met with, as a result of rigid contraction of the muscles of mastication, following extensive ulceration of these soft structures. This morbid condition is very distressing to the patient, who is scarcely able to take nourishment and speech is markedly interfered with. If seen early in the course of the morbid state, an effort should be made to prevent a complete closure of the jaws by placing a wedge of hard rubber or wood between the teeth on either side and retaining until the contraction of muscles has ceased or been overcome by operative means. In cases of rigid closure of the jaws from any cause, nourishment of a fluid nature is taken through a glass tube, which is inserted into the mouth through a space provided by removing one or more teeth from one side of the jaw.

INCISED AND PENETRATING WOUNDS OF THE JOINTS

The articulations sometimes suffer injury through stab and gunshot wounds that seriously cripple the usefulness of the limb. Small joints injured in this manner are less apt to be followed by serious consequences than are the larger ones; however, ankylosis generally follows any open wound of the smaller articulations and the loss of limb, and even life, has resulted from penetrating wounds of the elbow and knee joint, both of which are most liable to infection, which sorely impresses the whole system by rapid absorption of the septic fluids.

The common symptoms following this form of injury to the joints vary from a mere swelling and slight tenderness of the tissues about the articulation, to a train of symptoms commencing with a chill, followed by fever, thirst, swelling, pain, loss of appetite, delirium, and in grave cases coma, ending in death.

Following the injury to the joint the synovial fluid, which is clear and a little thinner than the white of an egg, will ooze from the wound in greater or less quantity. If there is any hemorrhage, the synovia will be tinged with blood to some extent. On inspection, if the wound be of considerable size, the cartilage and other deep structures about the joint may easily be seen. The margins of the wound should not be retracted except to remove foreign matter, and this procedure should be done under careful antiseptic measures. Not infrequently the tissues about the joint become infiltrated with septic fluid in cases where the wound becomes infected, markedly increasing both tenderness and pain.

The treatment of joint wounds is along the line of strict antiseptic methods. If seen early, the articulation should be inclosed with a sterile towel wet in quite warm antiseptic fluid: a dilute solution of the alkaline mixture will prove most efficient, as will a 1-5000 bichloride mixture.

The injured limb should be kept at rest in a slightly elevated position, if possible. After all danger of inflammation has passed, to prevent swelling, a roller bandage should be snugly adjusted over any antiseptic dressing first applied to the wounded part.

If the patient develops symptoms of sepsis, the following mixture should be prescribed at once:

R. Spc. Tr. Aconite ....gtt. x.
  Spc. Tr. Echinacea ....ℨ iij.
  Peppermint Water, q. s. ....fl. ℨ iv.
M. Sig.—A teaspoonful every hour.

In connection, the function of the kidneys and bowels should be kept alive by diuretics and the saline carthartic mixtures.

In serious cases, where the joint is extensively opened, followed by a tendency to slough, the traumatism should be cleansed with a 1-3000 bichloride solution and followed with normal saline washes. Efficient drainage should be provided for and the limb immobilized to prevent further injury to the articulation by attempts to use it.

Redressings should not be frequent unless the serious character of the wound demands it.

The general condition of the patient should not be neglected. Remedies should be administered to meet existing conditions. Spc. tr. of echinacea is usually indicated by the septic state of the wound, and veratrum if the feverish state continues.

In all cases of threatened prostration, the system should be kept toned up with peptics and tonics and stimulating and nourishing food taken in liberal quantities. Eggnog and sparkling wines may be taken with the meals, if not contraindicated. Diluted fruit juices and lemonade may be drunk freely.

CHARCOT'S DISEASE

This is an affection of certain joints quite similar in character to that observed in rheumatic arthritis. Individuals of a nervous turn of body are prone to the disease, as may be witnessed in persons who are threatened with locomotor ataxia and other lesions of the central nervous system. The true seat of the disease is in the structures in and about the joint, often involving the cartilaginous ends of the bones forming the articulation. The initial lesion is an active inflammation of the soft structures composing the joint, the process often being so virulent in character as to produce rapid changes in the joints at-

tacked. Following the inflammatory attack effusion of serum follows, which often causes the joint to appear twice its normal size.

In time the inflammatory fluid becomes absorbed, leaving the fibrous structures about the articulations weak and relaxed, allowing a considerable range of motion and a consequent deformity. In marked cases the articular cartilage is absorbed, permitting of a grating sound when the ends of the denuded bones are rubbed together.

The knee joint is more frequently attacked than are the other articulations, although the disease has been known to manifest itself in the elbow, shoulder, and even in the hip joint; but it is rarely observed there.

The symptoms commonly observed in this affection are enlargement of the affected joint (usually but one is involved), caused by an effusion of serum following inflammatory action, more or less tenderness at the onset of the disease, a notable relaxation of the ligamentous structures about the joint, and the resulting deformity to the limb; the grating sound sometimes obtainable between the ends of the bones in pronounced cases of the disease, where the articular cartilage has been destroyed, and the wide range of movement that the limb may take. Suppuration may take place in the joint where the inflammatory action has been great, in individuals whose physical state of the body has been impoverished by disease.

Dislocation has been known to follow attempts to actively use the arm or leg with greatly relaxed ligaments about the affected joint.

Treatment: This form of joint disease does not yield to medicinal treatment, except perhaps in the early inflammatory stage of the attack. To relieve the inflammation of tissue, and consequent tenderness, the joint should be massaged and bathed frequently with some active antiphlogistic solution, a reliable mixture of which may be composed of the following ingredients:

℞.
```
Carbonate of Potassium ...........  ............. ℥ iss
Tr. Opium  ...................................... ℥iij
Witch Hazel  .................................... ℥ iv
Water, q. s.  ..............................fl. qt. j
```

M. Sig.—Apply to the diseased joint, with mild massage,
every two or three hours.

Much relief may also be derived from painting the affected
joint with equal parts of veratrum, alcohol and tincture of ar-
nica every three hours, after which a flannel bandage should
be snugly adjusted to the joint.

Advanced cases are incurable by either medicinal or surgi-
cal measures. The best that can be done is to support the weak
and unstable joint with splints, or a suitable brace so construct-
ed that the patient can readily remove and readjust it to the limb.

Resection of the ends of the bones composing the joint has
been done, with the hope that a stiff articulation would be of
more service than a "flail-joint;" but owing to the feeble heal-
ing powers of individuals suffering from this ailment firm union
is seldom obtained between the bones.

CONTUSIONS OF JOINTS

Individuals engaged in hazardous employment are subject
to serious accidents to both legs and arms. Contusions in and
near the joints are frequently met with, and constitute most seri-
ous injuries in most cases. Not infrequently this form of in-
jury is complicated with a fracture of the limb, which adds ad-
ditional distress to the patient, besides often delaying the re-
covery.

Contused wounds are usually accompanied with more or less
inflammation, tenderness, swelling, pain, and hemorrhage in
the tissues about, and sometimes in, the synovial sac. Syno-
vitis frequently follows this form of injury, often resulting in an
ankylosed joint, seciously crippling the usefulness of the limb
ever afterward.

Treatment: Unless the injury ruptures the tendons and
synovial sac, recovery soon follows rest and appropriate treat-
ment, which should consist of the local application of cooling
lotions and a supporting bandage. The following ingredients
compose a lotion useful in bruised wounds about the articula-
tions:

℞.
    Menthol Crystals .... gr. xx
    Alcohol .... ℥ v
    Tr. Arnica .... ℥ iij
  M. Sig.—For external use.

In aggravated cases with ruptured tendons the latter should be cut down upon and an effort made to reunite the ends of the tendonous structures with catgut, after turning out blood clots and any extraneous matter that may be present in the wound. The operative work should be done under strict antiseptic precautions, and the patient kept at rest in bed. Abnormal conditions should be treated as they arise.

JOINT MOUSE

Loose cartilages, varying in size, are frequently found in the large articulations of the legs and arms. In the knee-joint, they are found more frequently than in other articulations, and as many as a half dozen have been taken from a single knee-joint in a young man eighteen years of age at one operation.

They may be of traumatic origin, resulting from a chipping off of a small piece of cartilage or bone from the articular surface of the bones forming the joint, by injury, or they may be the result of inflammatory process in and about the joint. They are of irregular shape, some being nodular, while others resemble an almond in form, and in nearly every case these bodies seem to have an independent existence, receiving their nourishment from the synovial fluid by absorption. They are very slippery, and slide about the synovial cavity in a most remarkable manner. Joints in which these bodies are found give no evidence of disease resulting from rheumatic, tubercular, or other affections likely to account for their presence, or to cripple the function of the articulation to any extent.

There are no characteristic symptoms of the presence of these loose bodies floating about the joint, except when one of them gets between the articular surfaces; the patient then experiences a sudden, intense pain that so severely impresses him that he frequently drops to the ground and is unable to rise. The joint is thus put out of use till the body is dislodged, and even

then inflammatory action is very liable to follow the injury to the joint, disabling the same for a week or longer. These floating bodies, if they are of large size, can be readily felt about the knee by careful manipulation. There is one morbid state from which the symptoms of these cartilaginous lumps must be differentiated; reference is made to the dislocation of the semi-lunar cartilages of the joint, which is always due to traumatic causes. The painful state of becoming suddenly crippled from the impinging of the floating body between the ends of the articular bones is usually promptly relieved by the dislodgment of the elusive body. Not so with the displacement of the semi-lunar cartilages; this lesion generally requires dextrous manipulation by the surgeon to adjust the deformity and relieve the distress. A person afflicted with this morbid state and having been "floored" by a catch of the body once, lives in dread that the painful process may be repeated at any time when moving about. Synovitis, more or less severe, frequently follows an attack of "joint mouse," which will be relieved by rest and the topical application of cooling lotions.

The treatment of the morbid lesion is both palliative and surgical; the former is accomplished by manipulations, position, and topical applications. The surgical course should be radical from the beginning. After locating the cartilaginous body, it should be held secure with the thumb and forefinger, while an incision is made down upon it through the overlying tissues, when the body can easily be extracted with dressing forceps. The rent in the capsular ligament should be sufficiently large to admit the forefinger, with which the capsule of the joint is explored for other bodies. When all have been removed, the capsule of the joint should be flushed out with normal saline solution, the incision in the capsule and overlying structures closed with continuous catgut, without drainage, and the limb placed at rest. If the wound does well, a plaster-of-Paris bandage should be applied every two or three days, extending from a point a sufficient distance below and above the joint to fix it firmly. If no unpleasant symptoms arise, the plaster cast should be left in place for a week or ten days, when it should be cut through in front, sprung open and the site of the operating

wound examined; if found to be doing well, the plaster cast is securely fastened with strips of bandage along its entire length and left for another week or ten days. In about two weeks, the patient should be allowed to sit up, and in four weeks he can go about on crutches; if the injury be in the knee-joint, care should be taken to keep the joint bandaged for a reasonable time, or to have it supported by the wearing of an elastic knee-cap.

Should the wound fail to unite by first intention, or suppuration delay the healing process, the cast should be removed, the limb supported by a splint and the wound kept clean with antiseptic washes, the best of which is peroxide of hydrogen and Thiersch's solution, used in various strengths to meet the required demands.

ARTHROTOMY

Arthrotomy is the act of incising a joint and is resorted to in correcting congenital dislocations of the hip joint; as an aid in reducing dislocations, when all recognized manipulations fail; in gonorrheal arthritis, where the synovial membrane becomes indurated or otherwise diseased, retarding recovery; in suppurative arthritis in tubercular joint disease, where the aspirated fluid shows pyogenic organisms. The joint should be well opened, thoroughly irrigated with 1-2000 bichloride solution, followed by quite warm normal saline solution and drainage established; and in syphilitic joint disease, where the differential diagnosis is difficult to determine between syphilitic and tubercular joint evacuation of purulent fluids in hip-joint disease; and in articular resections in extensive joint disease; and to overcome some phases of ankylosis and deformities.

The surgical preparation of the patient for the operative work will be the same as is usually put in practice for operations on other parts of the body. The site for the operation is rendered aseptic with bichloride, alkaline and other potent antiseptic solutions, the traumatic surface irrigated with the same, and the wound dressed with sterile gauze, cotton, and

bandages, and placed at rest until the resulting traumatic inflammation has subsided.

To execute the work, the operator will require a bistoury or scalpel, curved and straight scissors, mouse-toothed dressing forceps, curettes, surgical needles, needle holder, catgut and silkwormgut for sutures.

GOUTY ARTHRITIS

Arthritis of a gouty nature is frequently observed in the metatarso-phalangeal joints of the great toes and in the joints of the wrists and hands; the larger joints, such as the knee, hip and shoulder, are seldom if ever involved.

The local affection is the result of an excess of alkaline urates in the system, especially sodium urate, the crystals of which may be found in and about the fibrous tissues of the joints involved.

The deposit of an excess of the morbid sediment excites inflammatory action about the joints which, in most cases, is chronic in character.

Individuals who are high livers, eating rich, highly-seasoned foods, and indulge in excessive drinking of wine and other liquors, are especially liable to attacks of the disease. Sometime before the disease becomes manifest in the joints, the patient will experience attacks of indigestion, and the bowels will become locked from conditions contingent upon a torpid liver.

Upon examination, the urine will show an excess of uric acid and urates, which will be in evidence on the bottom of a glass if the urine is allowed to stand a day or two. An excess of uric acid will also be found in the blood, and the kidneys become irritable and tender from the presence of urates in abnormal quantities.

The inflammatory action about the joint may be so active as to cause a destruction of tissue by ulceration, which is usually followed by ankylosis, more or less pronounced.

Treatment: The treatment at the outset should be the elimination of the causes leading up to the disease, in so far as

possible, and if seen in the acute stages, remedies to control fever and pain should be prescribed according to the specific indications in each individual case. Aconite or veratrum associated with bryonia or jaborandi usually finds a place here, as will colchicum, citrate of lithium and the citrate or acetate of potash in most chronic cases. The function of the kidneys and bowels should be kept active and digestive disturbances corrected.

The diet should be composed largely of vegetables and nutrient broths and soups; eggs and custards may be partaken of every other day, and fruits liberally if they agree with the patient. Meats should be eschewed.

Locally, much benefit may be derived by massage, the application of dry heat and stimulating liniments. Holding the affected part in a hot air oven for a few moments is effective in relieving painful states; this should be repeated three or four times a day.

ARTHRODESIS OF JOINTS

Arthrodesis means the surgical fixation of a joint that has an abnormal mobility, resulting from paralysis or uncommonly lax ligaments.

The ends of the bones composing the joint are exposed through an incision made at the most suitable point, after which a portion of the cartilage is removed with the knife or saw, the wound is then closed and while the ends of the denuded bones are held in apposition in the position required, some form of immobilizing apparatus is adjusted. A plaster-of-Paris cast makes the most suitable dressing to apply, especially in children and other individuals who for one reason or another are hard to restrain from unnecessary moving about.

With no complication following the operation, union of the bones will take place in a month, a useful limb resulting, that would otherwise remain a useless member.

CARIES

Caries is of a morbid state of the osseous tissue, where the disease manifests itself in ulcerative spots upon the surface of the bone, which vary in size from the head of a pin to that of a five cent piece or larger. The disease may be observed on the spongy structures as a single ulcerative spot or the surface of the bone may be studded with many minute diseased points.

The disintegrating process in caries, is by molecular death, the affected parts breaking down in ulceration, the debris being eliminated from the system by the purulent fluid, resulting from the morbid change.

It is not by any means easy to successfully differentiate between a marked case of caries of the bone and a mild case of necrosis. As a rule the former disease renders the bone porous or honey-combed and there is no well-marked line to indicate where the disease area terminates, nor are the limitations indicated where the boundary lines of the healthy bone tissue terminate. As a general rule, the discharge from a caritic area is watery and foul smelling, while that from a necrotic condition is thick, curdy and pus-like.

From the outset on through the period of disintegration, there will be symptoms denoting a rather grave state of the body. There will be times when the patient will complain of rigors, which will be followed by fever, often of a low grade, and at other times hectic in character.

There will be soreness and pain in the muscles near the affected area, often associated with such severe bone pains that an opiate will be required to give rest and promote sleep.

Treatment: The course suggested in the treatment of necrosis will be applicable in the main to the treatment of caries. Special attention should be given to the hygienic surroundings of the patient, as good food properly prepared, and taken at proper intervals, together with fresh air and out-door exercise is very essential to ultimate recovery.

EXOSTOSIS

Exostosis are bony tumors springing from the outer surface of the bony structures of the body. These growths may be soft and spongy or very hard in texture; the former are usually found growing from the long bones of the limbs and generally near the articulations, while the latter are more frequently observed on the flat osseous structures, especially the bones of the cranium. Either variety does not develop to any great size, but they generally cause a bulging of the overlying soft structures, often causing more or less pain by pressure, the skin surface becoming somewhat excoriated by friction from the clothing, when they are located upon the limbs.

Pronounced soreness and lameness are frequently produced when the osseous tumor involves the attached tendon of important muscles. The outer surface of the soft tumor is frequently observed to be covered with a soft tissue, akin to cartilage and is quite free from vascular supply. The tumor is generally greater in circumference at its outer extremity than at its base, but is very dense near the surface from which it springs.

Treatment: The treatment consists in division of the overlying soft structures, exposing the bony outgrowth, which is then removed with bone forceps or chisel and mallet, after the parts involved have been aseptically prepared. Medicinal agents of a resolvent character have little or no effect in reducing the tumor when topically applied or injected beneath the skin with a hypodermic needle. The removal of the growths can be quite readily done under novocain anæsthesia.

PART NINETEEN

Deformities

WEBBED FINGERS

Webbed fingers are not uncommonly met with as a congenital defect, in which two or more of the digits are closely bound together by a web composed of skin and fascia, or by osseous union of the bones of the fingers.

Fig. 255.—Webbed fingers and the form of flap made for repair. (*Farnum.*)

Clinical observations of the defect disclose different degrees of severity. Some cases present but a slight extension of the normal cutaneous web between the digits, while in others the span may extend to the finger tips. Outside of a clubbed appearance of the hand and a somewhat crippled use of it, there are no symptoms.

Fig. 256.—Webbed fingers, showing outline for the palmar flap. (*Farnum.*)

Treatment: The treatment consists in separating the fingers by so dividing the intervening web that when the flaps are adjusted no raw surfaces are exposed.

Fig. 257.—The flaps dissected free and the fingers separated. (*Farnum.*)

In cases where the web extends well up towards the finger tips, Didot's operation is recommended (see cuts). In this operation, he makes two flaps; one on the dorsal surface of one finger and the other on the palmar surface of the second finger. To form these flaps, a longitudinal incision is made from its base to the edge of the web, both on the dorsal and palmar surfaces; at each end a transverse incision is made, as noted in the accompanying cut. The flaps are next dissected free from the intervening tissues, and the remaining portion of the web severed with scissors. Thus formed, the flap of one finger covers over the raw surface of the other, and when adjusted and secured by the necessary number of catgut sutures, no raw surfaces are left, endangering the fingers growing together again.

It is well to wait until the child is two or three years old before this operation is done, as previous to this time the hands

Fig. 258.—Margins of the flaps joined with catgut on the palmar side. (*Farnum.*)

are small and difficult to apply dressings on; besides, the child is too young to take proper care of the hands previous to this time. If the malformation occurs in connection with a super-

Fig. 259.—Flaps fashioned in the separation of webbed fingers. (*Farnum.*)

numerary digit, it is possible to remedy the defect by removing one finger. When more than two fingers are webbed together only one web should be operated on at a time; when this has healed the other may be treated in like manner.

SUPERNUMERARY DIGITS

Not infrequently, children are born with one or more extra fingers and toes. The deformity is, as a general rule, bilateral and is usually handed down as an inheritance to the unfortunate individual. One extra digit on the hand or foot is quite commonly observed, and as many as fifteen fingers and ten toes have been noted in one rare case. Cases have also been observed where the distal portion of the thumb was double, each

Fig. 260.—Supernumerary fingers.

Fig. 261.—Supernumerary fingers. (*Farnum.*)

having a well developed nail. The extra fingers are generally added on the ulnar side of the hand, and are usually quite well developed.

Maternal impression upon the fetus in early uterine life is given as a probable primary cause of the deformity in the first case, with the abnormality perpetuated from one generation to another through hereditary influence.

The proper treatment of this not uncommon deformity is the removal of the extra digits and the redundant tissue usually found at their base, by amputation, which may be executed any time after the child has reached the age of four months. To restore the parts involved to their normal shape in the worst

Fig. 262.—Supernumerary toes. (*Howe.*)

cases, it is often necessary to resort to resection of a part of the hand and foot.

PLASTER CASTS

If, for any reason, a model of the arm or leg is required, the same may be fashioned in the following manner: The portion of the limb to be treated should be washed with soap and water and freed of superfluous hair, and well smeared with olive or cocoanut oil. The plaster mould is usually made on a piece of board an inch thick, and wide and long enough to accommodate the nature of the work. A piece of piano or other fine wire several inches longer than the cast is next to be placed along either side of the limb and fixed with little slips of tissue paper wet with collodion, while attendants make tension at either end to keep it straight; in the absence of wire, clock-cord will to quite as well.

The necessary amount of plaster-of-Paris is then prepared by adding slightly salted water until it is of the consistency of thick cream; a liberal amount of the mixture is placed along the middle of the board from one end to the other, and the limb placed lengthwise in the mass, which is now fashioned up half way along the sides; next cover the upper half of the limb with enough of the plaster mass remaining to form a coating upward of a half inch in thickness. The plaster when first put on should be spread evenly and made compact with a spatula. As soon as the plaster begins to set the mould is cut into halves by see-sawing the wires outward on either side of the limb. After a wait of a few moments the upper half of the mould is removed and the limb then carefully lifted out of the under half. The two portions of the mould are then placed together and tied with pieces of tape, after which it is set aside to dry.

To form a cast of the limb, the mould is filled with plaster-of-Paris, thinned with water to the thickness of heavy cream, after its internal surface is well lubricated with sweet oil; it is then set aside until the mass hardens, when the mould may be removed by prying off each half separately. If the work has been properly done, a perfect cast of the part will be presented. Before pouring the plaster mass into the mould, care should

be taken that no lumps remain in the fluid, as otherwise a ni
smooth cast may not be obtained; this can be assured only
thoroughly stirring the plaster as the water is added. A lit
salt added to the mixture will make it set much quicker th
it would otherwise.

Fig. 263.—Left lateral curvature of the spine. (*Farnum.*)

LORDOSIS AND SCOLIOSIS

Lordosis is an aggravated curvature of the spinal column, the convexity being anterior. The abnormal condition is met with in different degrees of severity. The deformity is fre-

Fig. 264.—Front view of a case of lateral curvature. (*Farnum.*)

quently observed in individuals who have exceptionally round shoulders; in such cases, the forward curvature is considered compensatory to the backward curvature in the upper portion of the spinal column, and is the result of weakness of the spinal muscles.

Fig. 265.—Right lateral curvature of the spine. (*Farnum.*)

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Fig. 265.—Right lateral curvature of the spine. (*Farnum.*)

Lordosis is often the result of diseased conditions affecting the osseous and muscular structures of the back and hips; as examples of this nature, such morbid states may be mentioned

Fig. 266.—Lateral curvature of the spine, back view.   (*Farnum.*)

as Pott's disease of the spine, rickets, congenital dislocation of the hips, disease of the hip joint, and paralysis of the abdominal and lumbar muscles. Habits of body often contribute to distortions of the vertebral column, especially that of the lateral

curvature. As a result of marked curvature of the spine, degeneration of portions of the bodies of the vertebra frequently takes place, especially that part subjected to unnatural pressure.

Fig. 267.—Lateral curvature, front view. (*Farnum.*)

Scoliosis is a lateral curvature of the spine brought on by about the same causes as produce lordosis.

The common symptoms observed in lordosis are distress, pain and deformity, the severity of all of which depends upon the degree of abnormality in the individual case.

Treatment: To accomplish much along the line of treatment, corrective measures must be resorted to in the early stages of the deformity, and even then the curative efforts will have to be governed by the causative conditions in the presenting case.

Fig. 268.—A method of suspension for the application of a plaster-of-Paris jacket. (*Farnum.*)

The course usually followed is to correct faulty living, massage and otherwise stimulate weakened muscles; exercise out doors if the case needs fresh air and sunshine, change of posture that may be responsible for the deviation, and the application of a leather, wooden, or plaster jacket, or, what may be better in

Fig. 269.—Plaster cast of right lateral curvature, over which various forms of jackets are made. (*Farnum.*)

most cases, an anterioposterior spinal brace, adjusted to the body with pads and straps with buckles.

When the deformity is due to disease or dislocation of the hip-joints, these ailments should be corrected before attempting to reduce the spinal curvature.

Fig. 270.—Left lateral curvature, caused by empyema. From a plaster cast.

The treatment of lordosis is, in a general way, applicable to lateral curvatures (scoliosis), as the causes leading up to the morbid state are about the same.

GENU VALGUM—KNOCK-KNEE

A condition of the legs in which the knees are bent inward, presents a morbid state called knock-knee, or genu valgum. The position of the legs from the ilio-femoral articulations to the knee-joints does not present such a marked degree of deformity as exists from the knees to the feet.

From statistics it is learned that genu valgum occurs about one half as often as genu varum, and is observed among boys more frequently than girls. The abnormal condition is frequently confined to one leg, more frequently to both, and is

usually observed in children between the ages of two and five
when due to a rachitic state of the system; if the morbid state
appears at a later period, it is likely due either to some consti-
tutional taint or the injurious effect of occupation. There are
various degrees of the deformity observed among the afflicted,
some so slight that scarcely a hitch will be noted in locomotion,

Fig. 271.—A marked case of knock-knee. (*Farnum.*)

while in other cases the legs will lap and walking is nearly pro-
hibited.

In the majority of cases, there is an abnormal limit of mo-
tion in the knee joint, due to a lax state of the muscles and liga-
ments, which gives rise to the yielding of the articulation when
standing. The presence of flat-foot is a feature in an occasional
case of genu valgum.

Treatment: To accomplish much along the line of treatment, corrective measures must be resorted to in the early stages of the deformity, and even then the curative efforts will have to be governed by the causative conditions in the presenting case.

Fig. 268.—A method of suspension for the application of a plaster-of-Paris jacket. (*Farnum.*)

of a half or two-thirds of the bone with an osteotome and then bringing the leg into position by fracturing the undivided part, is a favored operation with many surgeons; following the partial division and fracture of the bone, the leg is placed in a slightly over-corrected position, which is maintained by the application of a plaster-of-Paris bandage, which is left in place for about three weeks, unless symptoms arise indicating that the healing process is complicated by sepsis; in such event, there will be a rise of temperature, attended with more or less pain. If the fracture does well, the patient will be able to stand with the aid of a crutch or cane in about six weeks, although it is well to keep the plaster cast on for a period of two or three weeks longer, merely as a support.

Forcibly fracturing the femur, through the medium of the osteoclast in knock-knee deformity, is frequently resorted to in many of our orthopedic institutions, where proper facilities can be arranged for the execution of this form of work. There are several makes of osteoclasts to be had from instrument dealers, all possessing some points of merit, the best of which are Grattan's improved, Collins', and Rizzoli's. Grattan's improved osteoclast should have the preference, for the face of the jack is quite blunt and curved and does not cut or severly bruise the skin, if manipulated by experienced operators.

From what has been said regarding the successful treatment of knock-knee by mechanical and instrumental methods, the fact must not be lost sight of that many cases of this form of deformity can be corrected by manual manipulations, if commenced at an early period and persisted in vigorously from day to day till the abnormal state of the leg has regained its normal condition. The legs should be rubbed once or twice a day with some stimulating lotion, or pomade, composed of thirty grains of quinine to the pint of whiskey, or to two ounces of cocoanut oil preceding each manipulation. The leg should be grasped at the ankle with one hand and medium traction exerted, while with the other, pressure is brought to bear upon the most prominent in-curving portion of the knee. The applied force need not be severe enough to cause distress to the patient. The treatment should be given morning and evening, even if mechanical appliances are made use of in the meantime.

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usually observed in children between the ages of two and five when due to a rachitic state of the system; if the morbid state appears at a later period, it is likely due either to some constitutional taint or the injurious effect of occupation. There are various degrees of the deformity observed among the afflicted, some so slight that scarcely a hitch will be noted in locomotion,

Fig. 271.—A marked case of knock-knee. (*Farnum.*)

while in other cases the legs will lap and walking is nearly prohibited.

In the majority of cases, there is an abnormal limit of motion in the knee joint, due to a lax state of the muscles and ligaments, which gives rise to the yielding of the articulation when standing. The presence of flat-foot is a feature in an occasional case of genu valgum.

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Treatment: In prescribing a line of treatment for the correction of this deformity, the state of the patient's health should be taken into consideration, and if constitutional ailments are present they must be corrected.

For this purpose iron, arsenic, phosphorus, and some of the lime salts, especially the syrup of the lacto-phosphate of lime, are frequently indicated. In early childhood, more can be accomplished by the application of mechanical devices, if the child is kept in the recumbent position, as allowing it to be on its feet lessens the pressure of any form of brace that may be utilized by sustaining the weight of the body while running about at play. Success will follow, in the majority of cases, the application of padded braces, when properly adjusted.

Fig. 272.—Iron brace and attachments, for the treatment of knock-knee. (*Farnum.*)

In aggravated cases, whether in children or adults, operative measures will have to be resorted to. The method frequently adopted in badly deformed cases is the excision of a V-shaped piece of bone, taken from that portion of the femur that will the best accommodate the normal shape of the limb following the after treatment. Macewen's method of subcutaneous division

of a half or two-thirds of the bone with an osteotome and then bringing the leg into position by fracturing the undivided part, is a favored operation with many surgeons; following the partial division and fracture of the bone, the leg is placed in a slightly over-corrected position, which is maintained by the application of a plaster-of-Paris bandage, which is left in place for about three weeks, unless symptoms arise indicating that the healing process is complicated by sepsis; in such event, there will be a rise of temperature, attended with more or less pain. If the fracture does well, the patient will be able to stand with the aid of a crutch or cane in about six weeks, although it is well to keep the plaster cast on for a period of two or three weeks longer, merely as a support.

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GENU VARUM—BOW-LEGS

Genu varum is a deformity of the leg, characterized by a bowing outward to the extent that the knee is thrown outside of a line extending from the head of the femur to a point mid-

Fig. 273.—Anterior bow-legs.

way between the malleoli. The abnormal state of the limb may be due to a deformity of the femur alone, or to the tibia, or to both the femur and the tibia, as is usually the case. It matters not to what extent the deformity is observed; the function of the knee is seldom primarily affected.

Fig. 274.—Mechanical brace for anterior bow-legs.

The chief factors to which the deformity is due are allow-ing the child to attempt to walk or to stand at a very early age,

rachitic state of the body, and the powerful action of the muscles upon the bones still weak from delayed ossification.

There are no symptoms pointing to the morbid state of the leg, outside of the presenting deformity and the rolling or waddling gait when attempting to walk. It is not an uncommon occurrence for this morbid state to exist in one limb while knock-knee is present in the other. The only affection with which the morbid condition is likely to be confounded is congenital dislocation of the hip, from which a differential diagnosis will usually

Fig. 275.—Mechanical apparatus for the correction of bow-legs. (*Farnum.*)

establish normal lines of the hip measurements in the former affection.

Much good can be accomplished by manipulative treatment of bow-legs, if undertaken early; but, if delayed until the bones harden, little can be accomplished toward straightening the limb, without resorting to mechanical or operative measures.

Treatment: The state of the patient's health should receive first attention at the outset of the treatment; if found to

be below par, as is usually the case, peptics and tonics should be advised. Syrup of the iodide of iron in proper doses should be taken after meals, and the syrup of the lacto-phosphate of lime, with Fowler's solution in combination, in suitable doses every three hours, between meals, taken in a little water. On

Fig. 276.—A pronounced example of bow-legs. (*Farnum.*)

alternate weeks, phosphorus in graded doses should be substituted for the iron. The food should consist of the coarser cereals, eggs, the juices of beef, rice and chicken broths in patients ten months of age and upwards, while under that age farinaceous foods must be given sparingly, if at all. Good fresh cow's milk, modified to approach that of the mother by the addition of barley

water, is the proper diet for the very young, with perhaps the addition of lime-water in small quantities.

If manipulative treatment be attempted in suitable cases, the work can be done by degrees, or at one sitting under anæsthesia, after which suitable retention splints should be worn while the general health is being improved; the best appliance is the plaster-of-Paris bandage, which is easily adjusted and not severely cumbersome. In aggravated cases, whether in the young or adult person, fracturing of the affected bone by the osteoclast, or resorting to osteotomy, is usually demanded; after which the limb is encased in a plaster cast, care being taken that the limb is held in the proper position while the plaster is setting.

TALIPES—CLUB-FOOT

Talipes is a generic term that is applied to any deformity

Fig. 277.—Double congenital talipes—equino-varus.

Fig. 278.—Talipes calcaneus. (*Farnum.*)

of the foot that deviates in any way from its normal anatomic relation to the leg.

The deformity may be congenital or acquired. If the latter, the morbid state will result from one of many causes, viz.;

Fig. 279.—Double congenital talipes—equino-varus. (*Farnum.*)

holding the foot in a faulty position during long spells of sickness, contraction of structures, the result of inflammatory action of the ankle joint, occupations embarrassing the normal position of the foot, rickets, and injuries.

There are four forms of the morbid state recognized by orthopedic surgeons, each differing from the others in some special feature. Talipes equinus represents an extension of the

Fig. 279a.—Talipes equinus. (*Farnum.*)

foot; in talipes calcaneous, there is more or less flexion of the foot upon the leg; talipes varus shows adduction or a turning inward of the foot; while talipes valgus presents the opposite form of deformity, that of abduction or a turning outward of the sole of the foot.

Talipes equinus, or that form of deformity in which the heel is abnormally elevated, is the most frequently met with in the acquired variety of the morbid state, while talipes varus is per-

haps the most frequent type observed in the congenital form. When elevation of the heel is a complication of the latter form of the deformity, the morbid state of the foot is designated talipes equino-varus. Congenital club-foot is mainly due to pressure during utero-gestation, and some hereditary taint that is transmitted to the fetus.

Another variety of club-foot, called talipes cavus, or pes cavus, is represented in a marked increase in the anterio-posterior arch of the foot, while talipes planus is the opposite of

Fig. 280.—Congenital talipes—equino-varus. (*Farnum.*)

talipes cavus, presenting an abnormally diminished arch, representing a form of flat foot. The paralytic form of flat-foot is usually due to poliomyelitis.

Treatment:. The treatment of club-foot, whether congenital or acquired, involves the technic of three methods of procedure; manipulation, mechanical, and operative. The treatment of congenital talipes should be commenced at as early a period as possible after the birth of the infant, and should consist of massage and manipulative force, so applied as to produce pressure and counter-pressure on vulnerable parts, that will aid

in placing the foot in a normal state. The foot is now held in this corrected position by the application of adhesive strips, each of which makes a turn or two around the foot and then ex-

Fig. 281.—Congenital club-foot. (*Farnum.*)

tends up along the leg to which it is made fast. If the plaster causes irritation of the skin, first run on the leg and foot a thin gauze bandage, following with the adhesive plaster, which should be secured by applying over it another roller bandage.

This will prove an efficient dressing in the large majority of congenital club-foot deformities, but, should a decidedly fixed dressing be demanded, none better could be adjusted than a light plaster-of-Paris cast, which should be replaced at short intervals, that no harm may be done to the tender tissues. Should the structures involved in the deformity be so slow to yield to this

Fig. 282.—Talipes equinus, with flexion of the toes. (*Farnum.*)

form of dressing that the foot does not assume its normal position in three or four months, operative measures will be imperative, and every tendon offering resistance will require tenotomizing. Should this course be decided upon, the tendo-Achillis is to be divided first, as many cases of deformity result mainly from a contraction of this tendon. Then grasp the foot and make an effort to force it into its normal position; any tendon offering marked resistance, cut it, as well as the skin and other tissue,

Fig. 283.—Method of treatment of club-foot by mani-
pulation. (*Farnum.*)

till the foot can be placed in a super-corrected position; anything
short of this will be to invite the morbid state known as "re-
lapsing club-foot." To accomplish successfully the operation
indicated, the successive steps should be carefully followed in

Fig. 284.—Sole plates for talipes valgus. (*Farnum.*)

what is known as the Phelps "open operation"; however, this
procedure is principally mentioned in connection with talipes
equino-varus. Briefly, the successive steps in this opera-
tion are as follows: After every antiseptic precaution has been
observed, run on an Esmarch bandage, commencing at the toes
and extending it to the knee, below which securely run on sev-
eral turns of the rubber cord; now remove the rubber bandage
from the foot and leg, and incise the contracted tendons and
other tissue on the inner side of the foot, commencing the in-

Fig 285.—Shoe and ankle brace for the treatment of
talipes equinus. (*Farnum.*)

cision just in front of the malleolus, extending it about one-
third way across the sole of the foot. After every resisting struc-
ture has been divided, the foot is forced into its normal position
by manual manipulation or by mechanical measures. Next
adjust a suitably-sized piece of rubber tissue to the inner side
of the foot, after it has been placed in some potent antiseptic
solution; over this run on a sterile gauze bandage, and over all,
adjust a plaster-of-Paris dressing, holding the foot in a slightly
over-corrected position while the plaster hardens. Now remove
the rubber cord at the knee that has been serving as a tourni-

quet. A blood clot usually forms in the gaping wound, which soon becomes organized through cell-proliferation from adjacent tissues. The cast thus applied is left in place for four or five weeks, unless symptoms arise indicating sepsis or destruction of tissue by pressure. The wound will have healed by the

Fig. 286.—Talipes equinus, resulting from long confinement in bed from disease. (*Farnum.*)

Fig. 287.—Same as Fig. 286, corrected by operation. (*Farnum.*)

time the cast is removed, if all has gone well; however, a supercorrected shoe should be worn for weeks and in some cases months following the removal of the cast. This operation, if executed by experienced operators, is devoid of great danger to the structures of the foot from any cause, and is usually successful in well-selected cases. The fact must not be lost sight of that after-treatment following operative procedures often de-

cides what the outcome will be and whether or not a relapse is likely to take place.

Talipes calcaneus seldom requires more than manipulation or massage to overcome the abnormal contraction of the flexor tendons complicated in the deformity, if applied early; other-

Fig. 288.—Showing the result of tenotomy and forcible replacement of the foot, in talipes- equino-varus. (*Farnum.*)

wise, the contracted tendons may require division, or the tendo-Achillis may be shortened, followed by the application of the plaster-of-Paris dressing or the properly adjusted shoe and brace. Talipes valgus requires merely manipulative force in the early stage of the deformity, with the foot held in a slightly over-corrected position, with a shoe made with a steel insole; at a later period, the morbid state may require the division of con-

tracted tendons and the wearing, for a season, of the shoe and brace.

Fig. 289.—Shoe with ankle brace and spring, for the treatment of talipes calcaneus.

The treatment of flat-foot may simply require the properly adjusted Whitman's brace, or, under anæsthesia, the foot may be forcibly straightened and fixed in the normal position by the plaster cast.

CLUB-HAND

Deformities of the hands are frequently met with, but the morbid state is not as frequently observed in children and others as is club-foot. The morbid condition may be congenital or the result of disease or accident, but whatever the cause, the deformity presents either extension or flexion of the hand upon the fore-arm with some degree of malformation of the carpus and lower end of the radius. More cases of deformity of the hand are observed resulting from paralysis than from any other one cause.

Club-hand deformities of minor degree are best treated by

manipulative methods, aided by braces or casts made of stiff leather or plaster-of-Paris, which should be applied with the hand in a supercorrected position, holding it thus till the cast hardens.

Fig. 290.—Congenital Club-hand. (*Farnum.*)

Cases of club-hand are frequently observed where one or more tendons are markedly contracted, on the result of which, the deformity largely depends; tenotomy is here required, and while this method is not as successful in correcting deformities of the hand as in club-foot, yet if done through an open wound and under strict antiseptic measures, excellent results have been obtained.

Through malformation or lack of development of one or both bones of the arm, at the carpal ends, osteotomy is fre-

quently performed as the first step in the line of a surgical procedure to overcome the deformity.

COXA VARA

Coxa vara is an unnatural shape or bending of the neck of the femur, due to causes other than disease. Normally, the neck bears a position to that of the shaft of the femur of an angle of about one hundred and thirty degrees; much of a variation from this standard creates a certain degree of deformity.

The chief causes of the abnormal condition are fractures and a soft state of the bones, due to an excess of animal matter. When due to the latter cause, both hips show more or less deformity. In pronounced cases the patient walks with difficulty and the legs are nearly always held at rest while crossed. The great trocanter stands out prominently and the legs are held in a state of adduction and the foot is generally everted. The patient walks with a waddling gait in double coxa vara and a limping gait when one hip only is affected. A condition known as lordosis exists in well marked cases of coxa vara, the latter being often observed in children affected with rickets and osteomalacia.

Treatment: It is only the marked cases of this variety of deformity that fall into the surgeon's hands for treatment, and at a time when nothing short of an osteotomy can accomplish anything along the line of correction. The upper end of the femur is approached through a small longitudinal incision made in the skin and superficial fascia, over the point selected to divide the femur. The osteotome is next introduced through the incision down to the bone, the edge of the instrument is then turned at right angles to the shaft, where it is steadied while a few smart blows with a mallet are directed upon it, driving it nearly through the bone. The instrument is then partly withdrawn and the cutting end changed in another course and another section made and if necessary, a third section is executed, when the remaining portion may be broken by a display of force with the hands. The external wound is cleared

of blood and closed with catgut, the limb is rotated to the position desired, where it is held by an assistant, while a plaster-of-Paris dressing is adjusted to the leg and pelvis, cutting enough of the lower part of the pelvic portion away, to provide for evacuation of the bowels. Before applying the plaster dressing, the leg and pelvis should be enveloped in cotton to prevent strangulation and provoking irritation of the skin. If the cast is properly made, it will effectually immobilize the broken bone until it unites, which will be in a month to six weeks, everything being favorable.

There are other methods of operating on the bone, but as none of them are easier of execution than the one given above, their procedure will be omitted here.

Following the operative work, close attention should be given to the general health of the patient. The individual suffering from rickets should have rich nourishing food, composed largely of earthy salts and animal fat. Young children should eat freely of good fresh cow's milk, cream of wheat and other cereals, care being taken not to overfeed, omit much sweet and starchy food and give a little bicarbonate of soda to keep down fermentation. Other articles of diet worth considering in the treatment of the morbid condition are olive oil, fried bacon, rice, fat meat, rich meat broths, lemon and orange juice, baked potatoes, coarse bread, butter, cream, greens and eggs. The latter should not be eaten by children much under two years of age.

Of the remedial agents of benefit in osteomalacia, may be mentioned phosporus, arsenic, the lime salts, iron and nuclein. A prescription commonly written for this disorder by the author is as follows:

R.
    Fowler's Solution .... ℥ ss
    Syrup Lacto-phosphate of Lime, q. s. ....fl. ℥ iv
    M. Sig.—From a half to one teaspoonful in a little water
    one hour after meals.

COXA VALGA

Coxa valga is an abnormal state of the neck of the femur, wherein the angle of the neck to the shaft of the femur is in-

creased, that is to say, the cervix and head are more on a straight line with the main shaft, than is observed in a normal case. The condition is the reverse to that noted in coxa vara.

A history of these cases generally associates the deformity with an injury to the joint, either in the form of a fracture or congenital dislocation of the hip.

The deformity occasions a limping gait when one hip is affected and an awkward locomotion when both bones are involved; other than this, there are no symptoms.

Marked cases only require correction, which is accomplished by severing the bone with an osteotome and manual manipulation, elevating the hip to the required position and immobilizing it by applying a plaster-of-Paris dressing as directed in the surgical treatment of coxa vara.

HALLUX VALGUS—HAMMER-TOE

Hallux valgus is a deformity of the foot, complicating the articulation of the great toe with its approximate metatarsal bone. In many cases, the deformity is so marked that the second and third toes are made to assume abnormal positions. A bunion or corn and in some cases both of these affections are present as a complication of the abnormally enlarged head of the metatarsal bone. This morbid state of the great toe is most frequently observed in adult life and in individuals having large feet. And, as one writer observed, "large feet is not a causative effect, if the owners would only wear shoes large enough for them." But the fact is indisputable that foot-wear is not made to conform to the shape of the normal foot and the narrowing of the shoe or boot at the toe is responsible for the deformity under discussion. Rheumatoid arthritis is a common cause of the affection and accidental causes are not uncommon.

If the morbid state is observed in its early stage, much can be accomplished through massage and the wearing of properly shaped shoes; but grave cases will require, besides massage, the application of some form of retaining splint, or excision of a part, or the whole joint. The retaining splint is so fashioned that it reaches from just in front of the internal malleolus to the end of

the great toe; it should be made of steel with an opening opposite the joint to prevent undue pressure on the prominent part of the joint. This thin steel splint is secured to the foot by bandaging or with adhesive strips, while the toe will be made to gradually approach the distal end of the splint by the application of a wide rubber band.

Fig 291.—Skiagraph of a case of double halux valgus.

The deformity of the foot known as "hammer-toe" represents the great toe drawn nearly at a right angle with the foot through the abnormal contraction of the flexor tendons, and in some cases of the lateral ligaments. The morbid state of the toe resembles in a marked degree the position the toe assumes in a paralytic state of the interosseus muscles, from which the former affection must be differentiated to adopt a successful course of treatment.

By some the cause of this deformity is thought to be of a congenital origin, but by far the greater cause can be traced to faulty foot-wear, especially to the wearing of shoes that are much too short for the length of the foot. The second toe may be the first to become deformed, owing to its being longer in many instances than the great toe. Besides suffering from the

Fig. 292.—Double hallux valgus and flat foot. (*Farnum.*)

deformity of the toes, corns usually form on the exposed parts, seriously affecting the patient when obliged to be up and about.

Treatment: The treatment requires the division of any and all contracting tissues or amputation of the toe in aggravated cases. If division of the ligaments or tendons is deemed proper, the foot and toes, after they have been straightened, should be held in position by strapping them to a stiff leather sole, or a steel insole fashioned specially for this purpose.

PART TWENTY

Lesions of the Male Sexual Organs

LACERATION OF THE URETHRA

The perineal urethra is frequently partially or completely severed from the force of a kick or from falling astride of some hard object. The overlying structures usually remain intact, although they may be so badly bruised that, following the injury, there is more or less escape of blood and serum into the adjacent tissues, that often results in an abscess, unless allowed to escape through a deep perineal incision, which should be made as soon as there is local evidence of a rupture of the urethra, giving the operator an early opportunity of uniting the ends of the urethra around a catheter or steel sound previously inserted, before sloughing sets in.

Retention of urine is a frequent complication of rupture of the urethra, which, if not relieved through the perineal incision, will require tapping the bladder above the symphysis pubis or through the rectum.

To suture a ruptured urethra, whether complete or incomplete, a grooved staff or catheter should be introduced through the urethra and into the bladder, when this is possible. The tissues over the rupture are divided by making a free incision in the median line down upon the staff at the point of injury. If the staff cannot be passed on into the bladder, but stops at the point of rupture, the advanced end of the instrument is cut down upon exposing the ruptured ends of the urethra and, besides, giving vent to the extravasated blood, serum and urine pent-up around the seat of injury. After the bleeding has been arrested, the proximal end of the urethra in complete rupture is picked up with forceps and, if posisble, the end of the staff or catheter directed into it and made to pass on into the bladder. It is not always easy to find the proximal end of the urethra,

especially when it lies buried deep in the bruised tissues of the perineum; however, by persistent efforts with a small bougie, while the margins of the wound are well retracted, the opening is usually found. Once the catheter or sound is introduced, the ends of the torn urethra are approximated and sutured with fine silk or catgut, the sutures being placed about one-eighth of an inch apart. The perineal wound is then cleansed of blood and serum and closed with silk-wormgut, or catgut if the latter is preferred.

It may be remarked here that, in cases where the proximal end of the urethra cannot be located through the perineal incision, a suprapubic cystotomy may be done, and a catheter or sound introduced into the posterior urethra from within the bladder. By this means, the obscure end of the urethra is brought into view, which is secured with snap forceps, while the distal end of the catheter introduced through the penile urethra is made to enter the proximal opening.

The catheter, which should be of silk texture, and around which the torn ends of the urethra are sutured, should be left in place five or six days, unless marked cystitis supervenes, when it may be removed and a new one substituted, using the utmost care in introducing it, not to injure the recently united portion of the urethra. The catheter is held in place with pieces of tape or strips of adhesive plaster. During the time the catheter remains in the bladder, the latter may be irrigated with boric solution once every day or two, if conditions should call for it. Following the removal of the catheter, graduated steel sounds should be passed every two or three days to insure a normal and uniform sized urethral track.

STRICTURE OF THE URETER

Stricture of the ureter may result from an impaction of a calculus and from destructive inflammatory action resulting from specific ureteritis or the presence of a tumor in or near the uriniferous duct. A kink in the duct, caused by a dislocated kidney, is sometimes responsible for the morbid condition.

The symptoms vary according to the degree of contraction that exists; if only partial, there is a gradual dilatation of the pelvis of the kidney. When the stricture is complete and occurs suddenly, the kidney quickly fills with urine, the stroma degenerates or becomes atrophied, the organ becoming one large cystic tumor filled with urine, producing a condition that is known as hydronephrosis. In some instances the tumor contains blood instead of urine, or the urine is mixed with blood as a result of injury; such a condition is known as hematonephrosis; should septic germs find their way into the kidney in the latter condition, it is said that a pyonephrosis exists.

The symptoms usually attending stricture of the ureter, from whatever cause, are tenderness over the region of the kidney and colicky pain, which in many instances is spasmodic in character. The amount of urine voided is generally reduced, although the call to urinate is frequent. Blood may appear in the urine, if an injury to the mucous membrane has occurred at any point along the course of the duct. The accumulation of fluid within the kidney may enlarge that organ to the extent that it may be outlined through the soft structures of the loins.

The condition is serious in character and soon results in destruction of the kidney, if the morbid state is not relieved.

Treatment: The treatment of stricture of the ureter consists in exposing the kidney and upper part of the ureter, when this is possible, through a lumbar incision of suitable length, and the obstruction removed, if one exists, or the ureter extended, if a kink is found to be the cause of the stricture. Much of the technic necessary in the operative work is given in the article on "Stone in the Ureter."

UNDESCENDED TESTICLE

From an abnormality in the development of the cord and the descent of the testicle, the latter is often retained in the abdomen or inguinal canal. If it finds lodgment in the abdomen, there are no symptoms attending its abnormal location. When it is retained in the inguinal canal, it is frequently accompanied

by inguinal hernia the complication giving rise to a distension of the adjacent parts and more or less pressure pain.

Inguinal tumors, bubonocele and buboes, located in and near the inguinal canal, are abnormal states from which a retained testicle is to be differentiated in forming a diagnosis. If it is discovered that the testicle located in the inguinal canal is accompanied with a hernia, in very young children, a truss should not be worn, as proper care of the child will favor a cure of the hernia and a truss would likely interfere with the descent of the testicle. Not infrequently both testicles are retained at birth, a condition easily determined by manipulating the scrotum.

Treatment: The treatment of undescended testicle, to be effective, will be especially along surgical lines. When the organ remains within the abdomen without symptoms, operative measures are not required. The pain and distress due to pressure, when its lodging place is the inguinal canal, or in the perineum, or the upper part of the thigh, beneath Poupart's ligament, the treatment demands that it be placed within the scrotum, when existing conditions make this procedure possible.

To transplant the organ within the scrotum from the inguinal canal, make an incision three inches or more in length, over the course of the canal, extending upward from just below the external abdominal ring, dividing all of the tissues overlying the cord. After reaching the canal, search for the fold or pouch of peritoneum containing the testicle; when found, slit it up sufficiently to expose the testicle; the pouch is then dissected free from the cord, the end ligated with sterile catgut and placed above the wound. The stump or severed end of the peritoneal sac enclosing the testicle should next be closed with a purse-string suture, the peritoneal sac thus formed making a tunic or covering for the testicle; next lift the testicle, which is still intact, with the cord, out of its bed, and make gentle traction on the cord to bring it to the required length, if possible, first freeing it of any and all retaining bands of fascia, preventing the lengthening of it, being careful not to injure the vessels and the vas deferens during the dissection. If the spermatic vessels and

vas prevent the lengthening of the cord, they should also be separated from it by blunt dissection.

The inside of the scrotum is now opened up by passing a finger through the incision in the inguinal region, forming a pocket into which the testicle is placed, closing the entrance to the scrotal pocket, with a purse-string suture, which should involve the edges of the external abdominal ring, to prevent the escape of the testicle from its normal position. During the operative work, due care should be exercised not to injure or allow the several sutures taken to compress the cord and its vessels.

The external wound is next closed in the usual manner of closing hernial operations, using sterile catgut for muscular structures and silk-wormgut for the external layers.

The wounded area is now dressed with several layers of sterile gauze and snugly bandaged. Barring infection, the external wound should be healed in two weeks. The silk-wormgut stitches can generally be removed by the eighth day.

WOUNDS OF THE TESTICLE

Wounds of the testicles may be of the nature of contusions, incised and gunshot injuries. The former is of quite frequent occurrence, while the incised wound is occasionally met with as a result of operations on the scrotum. Gunshot injuries of the testicles are always severe, but are not of common occurrence.

The symptoms of the former and latter variety of wounds are those of shock, manifested by pallor, extreme weakness, nausea, feeble heart action, cold perspiration, and more or less hemorrhage. Those following incised wounds are usually mild in degree, and yield very readily to treatment.

Treatment: The treatment consists in ligating bleeding vessels and uniting by catgut sutures, separated structures. Mild injuries may be successfully treated with cooling lotions, while the patient is kept at rest in bed. The severest cases will require castration. The conditions of shock will require the application of heat to the extremities, and small but repeated doses of stimu-

lants, such as spirits of camphor, brandy, aromatic spirits of ammonia, and strychnia. Sips of black coffee will promptly revive a swooning patient, and hot saline solution given per rectum is not without great benefit. All operative work should be done under a general anæsthesia.

TUBERCULOSIS OF THE TESTICLE

Chronic inflammation of the testicle, occurring in a man of a strumous habit of body, often eventuates in a deposit of tubercle in the stroma of the organ. The morbid condition of the testicle is also known as strumous orchitis or sarcocele, which is, in some cases, of uncertain origin. The granular deposit is usually first noted in the epididymis, and later appearing in the vesicula seminales and adjacent cellular tissue.

The morbid disease is slow in its evolutions, giving rise to little pain and distress in the early stages. Not until the tissues become greatly infiltrated with tuberculous matter is pain complained of, which is at this time due to nerve pressure.

The accumulation of tubercular deposits within the tunics of the testicle often causes them to rupture, permitting the gland proper to protrude through the rent. First the epididymis becomes enlarged, followed by that of the body of the testicle, which is usually oval in form, but may be somewhat nodular in some cases. The cord, with its adherent tissue, gradually becomes enlarged and tender to the touch, and the visicula seminales, and often the prostate gland develop to twice their normal size, which can be determined by an examination with the finger in the rectum. About this time, through sympathetic irritation, urinary disturbances supervene, with evidences of tubercular infection, in various parts of the body, notably in the lungs, throat and kidneys; rigors and hectic fever are at this time in evidence and the patient is apt to go into a progressive decline.

The morbid disease may attack both testicles at the same time; it is the experience of operators to find the disease developing earlier in one testicle than in the other. As the disease progresses, the tubercular deposits are likely to break down and

form abscesses, the purulent fluid eventually finding its way to the surface, leaving in its wake a fistulous opening. The pus usually finds its way into the rectum, perineum, or it breaks through the walls of the scrotum. A tubercular testicle can be differentiated from syphilitic orchitis by the enlargement of the epididymis and cord with adhesions of the skin, and involvement of the seminal vesicles and the general cachexia of tubercular infection.

Treatment: Constitutional treatment may stay the progress of the disease, and such remedial agents as phosphorus, arsenic, iron, nux and the lime salts are usually indicated. Rich, nutritious food should be partaken of freely, and frequent bathing in salt water and exercise in the open air should not be neglected.

If general improvement does not follow this line of treatment within a reasonable time, the organ should be removed, unless contraindicated by a general systemic invasion of the disease.

If removal of the gland is objected to, and abscesses form along the track of tubercular deposit, the pus should be evacuated through a small incision, the diseased area curetted, if practicable, and the cavity injected with iodoform emulsion or a solution of bichloride 1-2000, after opening up the cavity well. The patient should be placed at rest in bed during this form of treatment and fed on the most nourishing of foods. Sinuses forming after operative procedures may be curetted and dressed with potent antiseptics.

TUMORS OF THE TESTICLE

Owing to the varieties of tissue, of which the testicle is composed, it is possible for several forms of tumors to spring from the glandular organs.

The different forms are composed of adenomata, fibromata, fibro-cystic growths, and malignant tumors. The first two are, as a rule, of rather slow growth, while the mixed and malignant class develop rapidly in many cases; the former often attaining a considerable size. Of the malignant growths, sarcoma is the

most frequently met with, and is usually diffuse in character. Carcinoma of the testicle, if diffuse, is rapidly destructive.

The diagnostic symptoms of morbid growths of the testicle are few and unmistakable. The developing growth is first observed, and in time and as it increases in size, a dragging sensation is experienced. Benign growths and cystic developments present a smooth, regular outline, while the malignant tumor is nodular, or at least shows upon manipulation, an uneven surface, and has the consistency of soft elastic tissue. Pain is a late symptom, its degree depending upon the part of the organ involved. Cystic growths are especially elastic and, if painful, the condition is due to pressure.

Involvement of the lymphatics along the inguinal canal, and within the pelvis, is not uncommon in malignant diseases of the testicle, and very often gives rise to morbid conditions that end fatally.

Treatment: Remedial treatment accomplishes but little, if anything, in the management of morbid growths of the testicle. Early removal of the growth, together with the testicle and the greater part of the scrotum, if necessary, is the course to pursue in the majority of these cases, the post-operative treatment demanding the use of potent antiseptics and a stimulating internal treatment.

TUMORS OF THE SCROTUM

The tissues of the scrotum are subject to morbid growths that vary in size and form of development. Elephantiasis is one form of morbid growth of the skin and subcutaneous tissue, resulting from long-continued inflammatory action or obstruction of the lymphatic vessels. The scrotal tumor often assumes a large size, caused by the cellular tissue being filled in with inflammatory products, lymph and sometimes chyle. As a complication of elephantiasis, hydrocele is frequently noted, and a marked thickening of the skin and subcutaneous tissue of the penis is also observed in many cases. Growths of a malignant nature often attack the scrotum. Of this variety epithelioma is the most frequently met with. It is said that men engaged

in cleaning chimneys are especially liable to this affection; hence its name "soot cancer" or "chimney-sweep cancer." The morbid affection usually begins as a scaly papule or wart, which soon breaks open, forming an irritable ulcer that spreads slowly, but soon involves the inguinal glands, penis and testicles. The base of the ulcer is indurated and painful, and discharges a thin watery and foul smelling fluid.

Sarcoma and lipoma of the scrotum are sometimes observed, but they are not common.

Treatment: The treatment of elephantiasis, and other tumors of the scrotum, is early excision of a part or all of the scrotal sac under strict antiseptic measures. The loss of blood in amputation of the scrotum is controlled by adjusting a strong rubber band or tube around the root of the growth, drawing it tightly and, if necessary, the ends may be tied behind the back. The scrotum is slit down on either side, the testicle and cord are dissected free from their immediate connections and wrapped in wet sterile gauze and turned upward and laid on the abdomen. That portion of the scrotal sac that is diseased is next cut away, leaving enough healthy tissue, if possible, to cover in the testicles and their cords, if these organs are healthy, otherwise they are to be removed; while executing the operative work, the penis should be wrapped in sterile gauze, which can be pinned to a bandage previously passed around the body just above the hips to hold it up out of the way. To prevent the constricting rubber tube from slipping, a long straight surgeon's needle may be passed through a fold of the scrotal tissues on either side before severing the scrotal sac. The scrotum removed, the constricting band should be slowly loosened and the bleeding vessels picked up and securely ligated. If there is sufficient skin tissue left to cover the testicles, the free margins should be next united with catgut around these organs, and the wound dressed with sterile gauze, which can be held in place with a T-bandage or strips of adhesive plaster.

In cases where there cannot be sufficient scrotal tissue preserved to cover in the testicles and cords, flaps of integument of sufficient size may be taken from the adjacent parts to aid in

closing them in. While the wound is healing, care should be exercised to prevent, if possible, urine from contaminating it.

The removal of "soot cancer," epithelioma, in its incipiency and before the disease involves the inguinal glands and other tissues, is often followed by a complete cure. Enough of the adjacent tissue should be removed to insure getting outside of the diseased tissue changes wrought by the malignant sore.

Attention should be given to the patient's general state of health in the treatment of these morbid growths. There is usually noted a wrong of digestion and blood-making in a majority of these cases, calling for iron, arsenic, phosphorus, and the lime salts, combined with rich nourishing foods taken at regular intervals. The patient should take frequent salt water baths and plenty of outdoor exercise.

SPERMATORRHEA

Spermatorrhea is a term signifying an involuntary emission of seminal fluid without sexual excitement. The unnatural condition may be induced by several causes, chief among which are weakness of the sexual organs, caused by masturbation or excessive venery, irritation of some part of the genital organs, phymosis, varicocele, rectal irritation caused by worms, obstinate constipation, irritable prostate, and irritation of the nerve centers supplying the genito-urinary track. It is claimed that most of the above conditions, when occurring in young men, are apt to provoke the habit of masturbation, and again, masturbation may cause most of the conditions enumerated above.

The first symptom noted by the patient is an occasional emission at night, during deep slumber, while the patient is lying upon his back. As time passes and the morbid condition increases, these losses increase in frequency until the patient's strength and vitality are very much reduced. In cases due to masturbation, the patient is often found to be morose and mentally depressed; he courts privacy and imagines that his condition has ruined him for any of the higher positions in life. He cares nothing for social position, and in time his despondency brings on real or imaginary physical wrongs that drive him to despair.

He becomes anæmic and nervous through loss of appetite and sleep, his hands and feet are cold and clammy and his every movement is marked with a lack of energy; constipation, dyspepsia, palpitation of the heart, pain across the back and failing memory are prominent diagnostic symptoms of the sexual ailment, together with frequent losses of spermatic fluid, the spermatozoa of which are limited in number, abnormal in form and weak of vitality.

Physicians are often consulted by married men and others who have been accustomed to sexual intercourse several times a week, regarding an occasional nocturnal emission that may occur now and then during a period of abstinence; to such, if the general health is good, every assurance can be given them that no harm will follow the losses, and that it is but natural for the seminal vessels to free themselves when once surcharged.

Treatment. At the outset, the treatment has for its chief object the correction of any and all functional wrongs. Dyspeptic conditions must be relieved, constipation overcome, nervousness allayed, and the confidence of the patient fully obtained, that the moral advice offered by the surgeon will be respected and strictly followed.

The anæmic cases will require fresh air and sunshine, peptics, and tonics, of which the following formulas are most useful:

℞.
    Fowler's Solution .... ℨ j.
    Syrup of Lactophosphate of Lime,q. s. .... fl. ℥ iv.
M. Sig.—A teaspoonful one hour after meals, taken in a half-wineglassful of water.

℞.
    Citrate of Iron .... ℨ ij.
    Spc. Tr. Nux. .... gtt. v.
    Syrup Simplex, q. s. .... fl. ℥ iv.
M. Sig.—A teaspoonful every three hours during the day.

To prevent the nocturnal emissions, many medicinal compounds have been named, all having some virtue, if prescribed when the indications for the drugs are present.

The bromide of potash is in great favor in the treatment of this ailment, but should be given only when there is excitement of the sexual organs in vigorous persons; it is not the remedy

for the anæmic case with cold hands and feet and poor circulation. The drug can be given in twenty to thirty grain doses at bedtime, under the conditions named, with excellent results. The tincture of lupulin in drachm doses, taken in a wineglassful of hot water at four and at bedtime, will insure a quieting influence over the nerve centers of the genito-urinary tract, which will lessen the provoking cause of the emissions. Should there exist a hyperesthesia of the urethra and neck of the bladder, due to congestion, spc. tr. belladonna in small doses, given in an infusion of saw palmetto every hour or two, will give prompt relief. The passing of a steel sound once every other day will aid in a cure.

If the patient has a varicocele or a long contracted prepuce, surgical measures should be resorted to for relief from the nagging condition. The patient should sleep on a hard hair mattress and have regular hours to retire and get up in the morning. Cold baths to the perineum and external genitals followed by brisk friction will give a better circulation to the local parts. The patient should be warned not to sleep on his back, and, to prevent him from so doing, some obstacle like a spool, ball, or other hard substance, should be adjusted to the back by one or two pieces of tape.   ,

Fowler's solution of arsenic, taken in alternation with nit. of strychnia, is invaluable in cases due to disease of the brain and spinal cord. The food should be nourishing, but the patient should avoid pepper and spices, as well as alcoholic beverages in general.

Impotency, due to spermatorrhea and its weakening effect upon the genito-urinary nerve-centers, will be relieved by improving the general physical condition of the patient, and cold baths to the perineum, with brisk friction, followed by the topical application to the external genitalia of a lotion composed of:

R.
   Quinia Sulph. ....------...............℥ ss.
   Alcohol ....------...........℥ j.
   Violet Water, q. s. ....fl. ℥ iv.
  M. Sig.—Apply externally three or four times a day, last at
   bed time.   ,

To aid in the cure, use deep urethral injections of a few drops of the following mixture morning and evening:

℞.
    Nuclein Solution (Abbott) ....℥ iij.
    Spc. Med. Avena Sativa ....℥ ss.
    Sterile Water, q. s. ....fl. ℥ ij.
    M. Sig.—Ten to twenty drops injected through a female
    catheter to the deep urethra.

SENILE MICTURITION

A common ailment incident to old men is what may be aptly termed senile micturition. The difficult voiding of urine is not always the result of prostatic enlargement, as many presume; it is likely to result from a spasmodic condition of the urethra about one inch distant from the prostate. This portion of the urinary duct, in aged men, is frequently found to be indurated, contracted and sensitive to a marked degree, and provoked to spasm through irritation caused by the excessive accumulation of urates and phosphates in the urinary viscus. The surgeon, who has had extensive experience in catheterizing old men, has often recognized the "hitch" in the passing of the catheter at the point mentioned. This irritation and spasmodic condition above referred to provokes marked straining at each effort to evacuate the viscus, which in time results in a sacculated condition of the bladder posterior to the prostate. In this pouch-like portion of the organ is found much of the debris of the urine, which proves the provoking cause of the irritation alluded to.

Treatment. The first step towards relief in a case of this nature, is to relieve the exciting cause; this means the riddance, the washing away of sediment in the bladder. Should this be attempted at a time when the parts are in a state of spasm, much difficulty will be experienced, and pain inflicted, in the attempt to introduce the catheter, even though the operator be an expert in the manipulation of the instrument. The patient, perhaps, has not voided his urine except a few drops at a time for twenty-four or forty-eight hours; the bladder is distended and tenesmus keenly active; his every feature shows distress for the want of relief and sleep. If the catheter is not passed with the first effort, promptly administer one-sixth grain hydro-

chloride of heroin, or one-fourth grain of morphine hypodermically in the perineal region; either of the potent agents will temporarily relieve spasm of painful parts. The patient will nap for an hour or two and will void his urine as of old upon waking. Now introduce the catheter and cleanse the organ of all sediment that it may contain; for this purpose, I know of nothing that excels the alkaline solution composed of biborato of soda and salicylic acid, of each one teaspoonful to the quart of luke-warm water. This process should be repeated daily until all sediment has disappeared and irritation subdued, aided by an occasional dose of a solution of epsom salts, one drachm to four ounces of water, with lemonade taken freely as a drink.

To subdue obstinate vesical tenesmus in these acute cases, resort may be had to rectal injections of laudanum in starch water, ten to fifteen drops of the former to two ounces of the latter, repeated every three or four hours, as may be needed to keep the patient comfortable. If injections are not admissible, a suppository made of the following agents will be found comforting; codeine, grains ten; ext. hyoscyami, and ext. cannabis indica, of each grains two, cocoa butter, q. s., to make suppositories No. 12. One used as may be needed.

While the local vesical disturbance demands immediate relief, we must look after our aged patient's health in a general way. There may be functional wrongs that will need correcting, especially so will be that of the liver and stomach. As a peptic and tonic in an enfeebled state of body, phosphate of iron and strychnia are to be commended, and the passing of a steel sound once or twice a day will give tone to an enfeebled urethra. However, the surgeon must be discreet in his instrumental manipulations, that the local tenderness may not be intensified.

PROSTATITIS

Inflammation of the prostate gland is a common affection, especially after middle life. According to time, the disease is divided into two classes—the acute and chronic. The acute form is generally due to gonorrheal infection, but may result from traumatism and the presence of a prostatic calculus.

The inflammatory action is not confined to the gland alone in all cases, but is frequently reflected to contiguous structures, especially the seminal tubes and neck of the bladder.

The diagnostic symptoms present in the acute form of prostatitis are a dull dragging pain in the perineum and suprapubic region, and often reflected to the end of the penis; disurea and tenesmus from the existing irritation and glandular encroachment upon the urethral canal. There is a frequent desire to urinate and defecation increases the painful symptoms. The patient is usually restless and does not sleep well at night. Excitement of the sexual organs is not infrequent, but the erections are usually feeble and generally followed by a discharge of a thin glairy fluid. The latter symptoms are incident to the chronic form of the disease which follows the acute attack. Sexual excesses, the use of instruments, and deep caustic injections for the cure of gonorrhœa, occupations producing constant pressure against the gland, will in the course of time produce inflammatory changes in the organ. A life in the saddle, sitting on a hard bench, and the constant riding on a bicycle, are the kinds of exposure alluded to.

Other symptoms indicating the chronic form of the disease are weakness of the sexual organs, bordering on sexual neurasthenia, dribbling of urine, and a condition of despondency eventually creeping upon the patient. Examination per rectum will reveal a marked sensitiveness of the gland and in many cases a considerable enlargement will be noted. Abscess formations sometimes result in severe cases, and retention of urine is not uncommon.

Treatment. The treatment of the acute form of inflammation of the prostate will vary according to the stage of the morbid state when brought to the notice of the surgeon. Usually it will be well to open the bowels well with broken doses of epsom salts, and the action of the kidneys should be kept stimulated with minute doses of the same drug, taken in plenty of water. If the patient suffers from tenderness and pain, he should be kept at rest in bed, and hot fomentations of hops and stramonium leaves applied to the perineum. In severe cases, an occasional injection of tr. opium and starch water will prove

comforting, especially at bedtime, when rest and sleep are most desired. Rectal injections of cold or luke-warm salt water, to free the lower bowel from fecal matter to prevent pressure, will prove of benefit.

Internally, the patient may take teaspoonful doses hourly of the following mixture with much benefit:

℞.
    Spc. Tr. Aconite ....gtt. x.
    Spc. Tr. Gelsemium.............................gtt. xx.
    Aqua, q. s. ....fl. ℥ iv.

M. Sig.—Given in teaspoonful doses.

If there is a swollen condition of the gland and a discharge of prostatic fluid, the above mixture should be alternated with the following prescription:

℞.
    Spc. Tr. Hamamelis ....℥ ij.
    Spc. Tr. Staphisagria ....℥ j.
    Aqua Dest., q. s. ....fl. ℥ iv.

M. Sig.—Given in teaspoonful doses.

The patient should be urged to drink freely of water, and milk should form a part of the daily diet. Rich and highly spiced food should be eschewed.

Habits of an injurious nature should be first corrected in the chronic form of the disease, and abnormal conditions about the urethra and neck of the bladder remedied. If a stricture of the urethra is a troublesome feature, it should be dilated with graduated sounds, if possible, or incised. In cases where the inflammatory action has run high and destruction of tissue has eventuated in abscess formations, these should be treated by incision and drainage through the perineum. The general health should be improved with tonics and good food and the patient kept in a cheerful mood.

If the swollen condition of the gland causes retention of urine, catheterism will have to be resorted to, and, failing in this procedure, the bladder should be tapped above the pubes or through the rectal wall.

PROCTECTOMY

Proctectomy, or excision of the rectum, is performed for relief in incurable disease of the lower bowel. If the disease is situated in the lower part of the rectum, a partial excision only may be required, and this may be done through the perineal route, but when the upper part of the rectum is the seat of the disease, one of the numerous sacral methods now in common practice should be resorted to. Of these several methods, Kraske's procedure by removing the coccyx and part of the sacrum, is quite easy of execution, and when properly done gives as good results, if not better, than any of the others, hence his operation only will be given.

The implements usually required in the execution of this operation are strong, slightly curved scissors, scalpel, retractors a half dozen hemostats, dissecting forceps, cutting forceps, tenaculum, mallet and chisels, saws, bone forceps, needles, and needle-holder. For sutures and ligatures both silk and catgut are used.

The patient's preparation is not unlike that for other operations about the pelvic organs. The bowels should be thoroughly cleared out the day before the operation and the rectum just previous to going to the operating room.

If the patient is of a nervous turn of mind, one-fourth grain of morphine may be given one hour previous to the giving of the anæsthetic, but strychnia should displace the morphine in cases of weakly constitutions. Not infrequently the two drugs can be given together with excellent results in most cases. After the patient has been put under a general anæsthetic, he may be placed on the right side on the table, and an incision made in the median line, from about the middle of the sacrum to the anal opening, dividing the skin, fat, and fascia down to the bone and bowel below. The lower part of the left half of the sacrum and the coccyx should next be freed from all muscular attachments and the latter bone removed. By forcibly retracting the margin of the soft structures on the left side, the sacrosciatic ligaments are exposed and their attachment to the sacrum divided.

To more easily approach the rectum, that part of the sacrum on the left side below the second and even the third sacral foramen should be removed with bone-cutting forceps and chisel; necessarily the anterior branches of the fourth and fifth sacral nerves are divided and the nerve supply of the levator and sphincter ani, and the coccygeus muscles will be cut off or badly crippled.

With the coccyx and the lower left portion of the sacrum removed, the rectum will be brought into view and should be dissected out, beginning at the circular incision previously made around the anus.   Much difficulty is frequently experienced in freeing the rectum from the levator ani, the prostate, and the vagina in some cases, but with careful dissection with scissors, keeping close to the rectal wall, serious damage to contiguous structures can be avoided. The work of dissection can be greatly aided by inserting a sound or metal catheter into the bladder and holding it steady while the work is being executed.

After the rectum has been freed from adjacent tissues to a point above the diseased portion, a strong ligature should be tied around the bowel and the diseased portion removed with scissors; all the bleeding vessels should now be secured by ligature and the margins of the external wound brought together and secured with silk-wormgut sutures, except the upper angle of the wound, where the end of the bowel is placed and secured with numerous sutures of medium-sized silk to the margins of the skin, and the wound dressed antiseptically. It has been suggested that the lower end of the bowel be given a slight twist before fixing it to the skin, that it will be in better position to retain its contents.

HYPERTROPHY OF THE PROSTATE

Many men at the age of sixty years, have chronic hypertrophy of the prostate, but every case where difficulty is experienced in voiding the urine, should not be charged to this cause.

It must be remembered that, in the advanced stages of life, there is a general letting down of the tonicity of the system,

both as to the nervous and muscular forces. We notice the flabbiness of the muscular tissue, the wrinkled skin, the slowing down of the pulse, the tottering step, the functional irregularity of the bowels, all indicating functional weakness and a loss of nerve force.

When we study the structure and function of the bladder and prostate, we readily see that, owing to their immediate relationship, how a diseased or abnormal condition of one can reflect a structural or nervous disorder of the other.

The structure of the prostate, being composed of muscular and glandular tissue, is prone to take on interstitial hypertrophy, affecting in most part the posterior portion or middle lobe of the gland, worried into this condition, in the majority of cases, by chronic cystic derangements in elderly men, the result of varied causes, not an uncommon one of which is the loss of expulsive power to completely evacuate the viscus during urination, always retaining a sufficient amount of urinary deposits to keep up continuous irritation about the most dependent portion of the organ.

If this cause can early be recognized and the cystic derangement relieved, the prostatic disturbance will soon cease to be a source of inconvenience.

One of the early symptoms of the trouble is a hesitancy in urinating, and patients apt to imagine they are suffering from gravel, and soon seeking medical advice for the supposed ailment. They will look with distrust upon the physician, should he fail to find evidence of gravel in the many specimens of urine that they will bring for examination from time to time. The medicinal qualities of the water of mineral springs will be called into use, as will the many reputed diuretic remedies that will be suggested to them by their friends, but after a long period of aggravation and worry, they at last drift into the hands of the surgeon, who, if he be experienced along this line of work, will bring relief to the long time sufferer.

Treatment. If a catheter can be introduced, much relief will be obtained from washing out the bladder once or twice day with a warm solution of salicylic acid and borax, ten ins of the former to one drachm of the latter to the pint of

hot water, used as warm as can be comfortably borne. By this means, the viscus can be cleared of its sedimentary urine, which is a prime factor in rendering the urine acrid and irritating. Where there is pronounced vesical tenderness, with burning, three drachms of Lloyd's colorless hydrastis should be substituted for the salicylic acid; to the solution add three grains of cocaine in severe painful states.

Spc. tr. of nux, or the sixtieth of a grain of nit. of strychnia three times a day, may be administered both for its general and local tonic effect in broken down anæmic cases.

Massaging the prostate through the rectum has accomplished some good when properly executed, but it is not a popular method of cure with the physician or patient.

Retention of urine, resulting from a pronounced irritation about the prostate, is often relieved from the use of a rectal suppository containing the following remedial agents:

B.
    Codeine ....grs. vij.
    Ext. Hyoscyami ....--............................
    Ext. Cannabis Indica, āā ....grs. ij.
    Cocoa Butter, q. s. to make suppositories No. 12.
    M. Sig.—One used morning, noon, and at bed time.

The surgical treatment for enlarged prostate will now be considered, for, as intimated above, this morbid state, if of long standing, can in the main be cured only through surgical intervention.
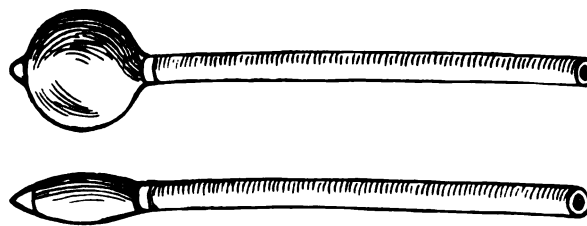
Fig. 293.—Rubber retractors used in perineal prostatectomy, as shown in the accompanying illustrations.

Not many years ago, the fact was noted that atrophy of the prostate followed the castration of animals. This fact led Prof. J. W. White, of the University of Pennsylvania, to further experiment along this line. His experiments were highly

satisfactory, and he earnestly advocates the removal of both testicles as the operative treatment in hypertrophy of this gland. This course, like massage, while in a measure effective, is not a popular form of treatment for this trouble, for it is expected a man would seriously object to being castrated unless positive assurance can be given him that permanent relief will be obtained by the loss.
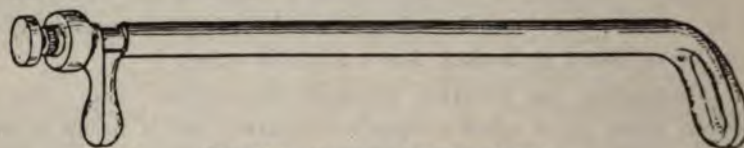
Fig. 294.—Young's tractor closed.

Of the other operative methods, two only will be considered here as being practicable—perineal and suprapubic prostatectomy.

The former is executed as follows: with a lithotomy staff introduced into the bladder, and steadied by the hand of an assistant, make an incision in the median line through the perineal structure to the staff, opening the membranous urethra, about one inch; through this incision the index finger is introduced, and pushed on through the prostatic portion into the bladder,

Fig. 295.—Young's tractor open.   (*McGrath.*)

thus splitting and dilating this constricted portion of the canal; a retractor, preferably made of a section of hard rubber tubing, with a small thin rubber sac at the distal end, is now introduced through the opening into the bladder, after which it is inflated through the tubing to which it is attached. Traction made through this medium brings the prostatic portion of the bladder within reach for further manipulating purposes. By blunt dis-

section with the finger, the fibrous sheath of the gland is exposed, which is incised on each side of the urethra, and with the index finger, pushed or dissected back and the gland enucleated from its bed. As one side is shucked out, the rubber retractor compresses the empty space, thereby preventing hemorrhage. When the entire morbid growth is removed, the parts are irrigated with saline solution, the retractor removed, a large drain-
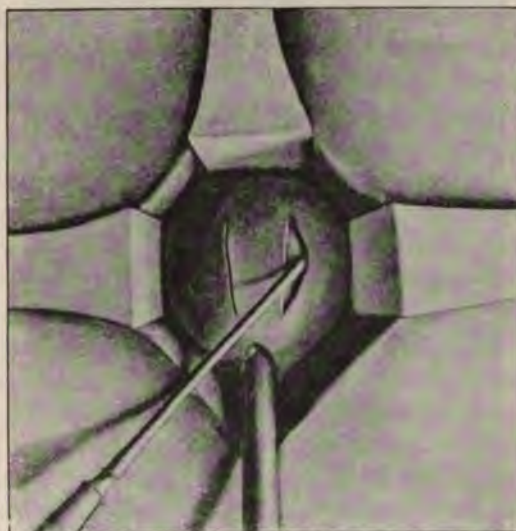
Fig. 296.—Perineal prostatectomy. The membranous urethra has been opened anterior to the prostate, and a tractor introduced. An incision is next made through the sheath of the prostate. The sheath is then detached from the right lobe with the blunt dissector. (*McGrath.*)

age catheter introduced into the bladder around which the wound is packed with iodoform, or bichloride gauze, and the external wound temporarily drawn together with silk-wormgut sutures, after which the patient is put to bed. The packing is to be removed at the end of twenty-four to thirty-six hours, and the drainage tube in two or three days, if all goes well. The patient is allowed to get up in three or four days, if there have been no untoward symptoms to prevent it. If the operative work is dextrously executed, there will be no shock and little hemorrhage. The bladder function will be restored in

a few days, and the relief from the former harassing state will be welcomed.

The successive steps in a suprapubic prostatectomy are about as follows: after the external operative site has been sterilized, the bladder and urethra are cleansed with warm al-

Fig. 297.—Perineal prostatectomy. The sheath of the prostate has been opened and partly detached from both lobes, and is drawn aside with retractors. The prostate body has been split in the middle line, and the prostatic urethra opened from the membranous portion. Just behind the bulb, backward, upon the metal sound within the urethra, the right lobe of the prostate, grasped with a volsella, has been almost completely enucleated. (McGrath.)

kaline solution through a silver catheter, which is left in place and made to serve as a guide to cut down upon when making the incision through the tissues of the abdominal wall, which is made in the median line. The prevesical fat lying next to the bladder must be separated by the fingers, aided by the handle of the knife to avoid active hemorrhage. Seize the bladder wall

at the indicated point of the catheter with a tenaculum forcep,
and with the knife or scissors extend the incision about three
inches on a line with the catheter, through the wall of the blad-
der. The instruments are then laid aside, and the index finger is
introduced into the viscus and used as an exploring medium, to
determine the size and position of the prostate, aided by two
fingers in the rectum to elevate and fix the gland during the
manipulating process. If the condition of the gland now seems
a suitable one for removal, the mucous membrane is severed with
the finger-nail over the most prominent part of the tumor down
to the fibrous coat of the gland, the finger is made to separate
the fibrous sheath and shuck out the gland, whole or in part,
care being taken not to tear into or otherwise injure the urethra.
The gland removed, the viscus is cleansed of all clots and foreign
matter, a perforated rubber drainage tube about twenty inches
long is placed in the bladder, one end extending eight inches or
more outside of the abdomen, and wrapped in sterilized gauze.
The bladder incision is now sutured with catgut around the drain-
age tube, and the borders of the abdominal wound approximated
and sutured with silk-wormgut. The drainage tube can usually
be removed in five or six days. The bladder can be carefully irri-
gated through the urethra, during this time, with some anti-
septic fluid, if the conditions seem to warrant, but usually the
patient will void his urine in a day or two if all goes well after
the operative work is completed. The patient should assume a
semi-sitting position following the operation.

It matters little which of the operative methods is adopted,
success will not crown our efforts in all cases. A feature of these
cases is that they apply for surgical relief after they have ex-
hausted all other means of cure. Their health at this time is
broken down; they are nervous, anæmic, and discouraged, but
hope for any relief stimulates them to accept the inevitable and
make the effort.

ORCHITIS

Inflammation of the testicle is caused by traumatism,
mumps, tuberculosis, infection, malignant disease, gout, and
from a badly treated gonorrhœa; by that is meant that injec-

tions of an astringent or irritating nature are used before the acute inflammation of the urethra has subsided. The morbid state is usually confined to one side, though there is no valid reason why the glands of both sides should not be similarly affected through continuity of structure.

The diagnostic symptoms of the affection are dragging pain in the testicle and cord, tenderness upon pressure, heat, redness and swelling of the scrotum.

Not infrequently the discharge ceases during the height of the inflammatory attack when due to gonorrhœa. Severe phases of the disease are attended with high fever, coated tongue, nausea, vomiting, and constipation. The relish for food is lost, and rest and sleep are markedly broken.

Treatment. The treatment in the acute stage has for its aim the relief of fever, nausea if present, tenderness and pain in the testicle and to give rest. If possible, the patient should be kept in bed, aconite and gelsemium in small doses should be given internally, alternated with macrotys and phytolacca; tr. of veratrum and hamamelis, one part of the former to three of the latter, should be topically applied to the scrotum every two hours, or hot fomentations of hops and stramonium leaves may be applied to the scrotum with good effect. The scrotum should be supported on a cotton pillow or kept turned up toward the abdomen. If the bowels are bound, they should be opened with a brisk purge of sulph. of magnesia, followed by the saline laxatives. Severe pain may, at the outset, be relieved with codeine or heroin hypodermically administered.

If the swelling of the testicle does not subside with the relief of the acute symptoms, it should be strapped with adhesive plaster snugly applied, while slight traction is made on the diseased testis. The first strip of plaster, about a half inch wide, is made to encircle the cord and overlying scrotal tissue near the pubes; it must be applied tight enough to prevent the testicle from being drawn within its boundary; the next strip and the succeeding ones are adjusted in like manner, each slightly overlapping the preceding one, till the entire scrotum is covered in, with the exception of the lower portion, which is covered with three or more strips, adjusted vertically instead of in a

circular manner. If properly adjusted, this dressing generally gives immediate relief from pain, and as the swelling subsides the adhesive dressing should be removed and another applied. The hair on the scrotum should be snipped away with scissors before applying the adhesive dressing.

In cases where the inflammatory action runs high, followed by effusion into the tunica vaginalis, it will be well to puncture the tube with a narrow bistoury, tenotome, or, a large aspirating needle, and evacuate the serum.

When the morbid condition of the organ is due to tuberculosis or cancer, local treatment avails but little. The testis should be removed as soon as the specific character of the disease has been unquestionably determined and the patient put on potent systemic remedies, as arsenic, phosphorus, sulphur, iron, nuclein, the preparations of lime and soda, together with good, rich, stimulating food.

AFFECTIONS OF THE PENIS

Inflammation

The penis is liable to attack of inflammation as a result of urethritis, traumatism, the passage of sounds and catheters, and the presence of foreign bodies in the urethral canal. Excessive masturbation is often an exciting cause of the morbid state and diabetic persons frequently note an inflamed condition of the glans penis.

The symptoms are those usually noted in inflammatory conditions of other structures of the body, chief among which are heat, pain, redness, and swelling, with tenderness on pressure. Urination is accompanied with more or less of a scalding feeling in the urethra and a dragging sensation is often experienced in the testicles as a result of sympathetic irritation.

Treatment. The treatment will depend largely on the exciting cause. If it is due to specific urethritis, the treatment usually prescribed in this disease will relieve the inflammatory state of the penis. If due to traumatism, the aseptic treatment of the wound will reduce the resulting inflammation. The re-

moval of urinary calculi and other foreign bodies from the urethra, with the proper after-treatment, will cure the inflammatory action set up in the penis, provoked by their presence.

Urethral injection of warm boric solution several times a day will prove beneficial, and topical applications of the following mixture to the penis will prove comforting and curative:

R.
    Spc. Tr. Veratrum Vir. .... ℥ ss.
    Witch Hazel .... ℥ j.
    Aqua, q. s. .... fl. ℥ iij.
  M. Sig.—For topical application.

The bowels should be kept open with an occasional dose of the saline laxatives and the urine neutral with the alkaline diuretics.

The diet should be light and nonstimulating and active exercise should be dispensed with.

Fracture

Fracture of the penis sometimes occurs as a result of traumatism and violent sexual congress. The accident can hardly occur except the penile organ be in a state of erection.

The symptoms following the injury are acute pain, swelling and deformity with inability in some cases to void urine; not infrequently there is an effusion of blood into the tissues of the penis and the organ is excited into a state of priapism.

The treatment consists of topical applications of cooling lotions to the penis and the adjusting of any displacement that may exist, after which the normal state of the organ may be maintained by inserting a metal catheter upon which the organ is strapped or lightly bandaged. If this method be not feasible, the penis is very apt to assume a curved position while healing.

Gangrene

Gangrene of the penis is the result of cutting off the circulation by ligature, mechanical pressure, and paraphimosis. It may also result from syphilitic ulceration in persons of feeble health, and injuries of an accidental nature.

The early symptoms indicating the nature of the approaching disorganization of tissues are pain, swelling due to conges-

tion, and dull redness in appearance. Later symptoms are the purplish hue that the end of the penis assumes, anæsthesia of the affected area, and putrescent vesicles appearing upon the foreskin usually accompanied by the odor of putrefaction.

The treatment of the morbid condition should be by both local and general measures. The former consists of topical applications to the affected part, the most potent mixture at our command being the following:

R.
Salicylic Acid ....3 j.
Biborate of Soda ....3 ij.
Glycerin ....3 iij.
Aqua, q. s. ....fl. O j.
M. Sig.—Apply on lint or cotton.

To be effective, any constrictive medium must have first been relieved before resorting to the application of antiseptics. Carbolized solution is commonly prescribed as a wash in gangrenous conditions, also a five per cent solution of asepsin. In the majority of cases of gangrene of the penis, topical remedies should be applied comfortably hot, that stimulation may be excited as quickly as possible. Not infrequently suppuration takes place as a result of devitalization of the deeper structures of the penis; when this morbid state becomes evident the pus should be evacuated without delay and the wound dressed with the alkaline solution.
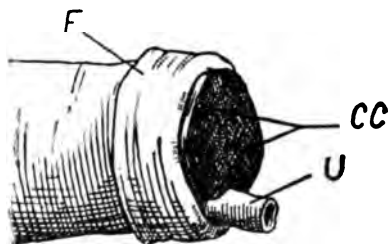
Fig. 298.—Amputation of the penis. CC, corpora cavernosa; F, skin flap turned back; U, urethral portion cut long. (McGrath.)

As soon as it can be determined that the devitalized part is past recovery, amputation above the line of demarcation should be done at once. The technic of this operation is as follows: With the patient anæsthetized and the penis aseptically pre-

pared, the root of the penis should be constricted by a rubber band, after a metal catheter has been introduced into the urinary canal. The skin is then slightly retracted back upon the penis and divided, together with the superficial fascia and underlying cellular tissue. The corpora cavernosa are now divided transversely down to the corpus spongiosum about on a line with the

Fig. 299.—Amputation of the penis. Edges of the skin flap united to each other over the ends of the corpora cavernosa, and to the edges of the split urethral portion. (*McGrath.*)

retracted skin. The corpus spongiosum, including the urethra, is dissected forward and severed about one-half inch anterior to the stump of the corpora cavernosa, that provision may be made for retraction of the urethra. The ends of divided blood vessels are next picked up and ligated with fine catgut. The principal vessels needing ligation are the two dorsal arteries and the arteries of the corpora cavernosa, which are found near the center of these bodies. If there are other vessels which need tying, their presence may be located by loosening the rubber band previously tied around the body of the penis near the pubes. The under side of the urethra should now be slit backward about one-half inch, to provide for cicatricial contraction during the healing process, and with hemorrhage checked the margins of the urethra and skin should be approximated and sutured with silk. The after-dressings consist of antiseptic washes and sterile gauze pads and bandages.

Amputation

Complete removal of the penis is sometimes required in extensive disease of the organ. The patient is prepared as in doing a partial amputation and placed in the lithotomy position.

A metal catheter is introduced into the bladder and the scrotum divided to the corpus spongiosum in the median line, using the raphe as a linear guide. The corpus spongiosum, including the urethra, is then dissected out as far forward as the triangular ligament, by blunt dissection, where it is transversely severed, after the catheter is withdrawn. The skin and fascia of the penis are next divided at the junction of this organ with the scrotum, by a circular incision; the suspensory ligament is then exposed and divided, and the corpora cavernosa and crura freed from the rami of the pubes and ischium by blunt dissection, or the use of the periosteal elevator. The latter procedure is aided materially by making traction on the penis while the edges of the scrotal wound are retracted by assistants. With the penis separated from its attachments, the bleeding points should next be secured by ligature and the urethra sutured to the margins of the perineal wound, first slitting it back for a half inch on the under side to avoid cicatricial contraction. The margins of the scrotal integument are then united around each testicle with cat-gut, forming a separate scrotal sac for each of them. Provision should be made for drainage, when the nature of the case justifies it. Following the operation, the wound should be kept clean with antiseptic washes and dressed in the usual manner.

Epispadias

Epispadias is a congenital malformation of the penis, where the opening of the urethra is found upon the dorsem of the organ. It is due to an arrest of tissue development and is frequently associated with extrophy of the bladder. In some cases, the upper part of the urethra and corpus spongiosum are markedly deficient, or are entirely wanting; the corpora cavernosa do not maintain their proper relationship with each other and adjacent structures, presenting a fissured appearance of the organ, and often exposing the floor of the urethra.

The arrest of development may give rise to deficiencies of the penis other than those mentioned above, with sometimes partial or complete incontinence of urine as a complication.

Treatment: The treatment is by surgical measures, and the method of Thiersch is usually preferred to that of Nélaton and others, although it is done in successive steps, requiring a

considerable period of time to remedy the defect, and to prevent complications from arising during the performance of the operative work, from the urine coming in contact with raw surfaces; he advises making an artificial opening in the urethra in the perineum, through which the urine is voided during the time of treatment.

The creation of the artificial meatus and the portion of the canal occupying the glands constitutes the first step. The latter is executed by making deep incisions on either side of the urethral groove in the glans, paring the surface of the outer lip of each incision, and then bringing the freshened surfaces into contact, where they are fixed or held with the required number of sutures of fine silver wire.

The creation of the urethra along the body of the penis constitutes the second step in the operative work. An incision is made through the skin and subcutaneous tissue along the edge of the urethral gutter on the right side; extending from each end a short transverse cut is made outward, then dissecting up the flap thus marked out, which should include the skin and fascia. Another longitudinal incision of the same length is then made on the left side about one centimeter external from the edge of the groove, and a short transverse incision extending at right angles from each end inward. This flap is next dissected up, making it as thick as the tissue will permit, and then turned back over the urethral groove, forming a roof for the same, the skin surface resting downward and the traumatic surface upward, its free border being made fast to the base of the flap on the right side of the grove by several chromicized catgut ligatures. Then the raw surface of the first flap is drawn across that of the second, and its outer edge made fast to the skin its entire length on the left side.

The third step constitutes the closure of the gap existing between the two sections of the urethra, and is done by making a transverse incision in the prepuce, and passing the glans through it, afterwards paring the borders of the gap and fixing them to the edges of the incision in the prepuce.

The fourth and last step of the procedure is the closing of the infundibulum. This is accomplished by dissecting flaps

from the groin, quite similar in process to that followed in the second step in the operation. These flaps are fashioned to meet the requirements in the individual case, the raw surfaces being brought in contact with each other and made fast with sutures.

With the new urethra established, the fistulous opening previously made in the perineum should be closed by freshening its borders and placing a suture or two.

Hypospadias

Hypospadias is a congenital defect in the formation of the penis, characterized by the urethra opening upon the under surface of the organ at any point between the end of the penis and the junction of that organ and the scrotum.

The urethra does not always end at the opening in the integument in the penis; it not infrequently extends beyond this point in the form of a blind pouch or tube.

Three varieties of the morbid condition are described by works on surgery, the scrotal, balanitic, and penile. The scrotal form is the most difficult to rectify, the balanitic the most frequently met with and the easiest remedied, while the penile variety is quite as readily corrected as the balanitic and much more so than the scrotal. Seldom does the balanitic variety require operative measures, especially if the opening is of the normal size, and the anterior portion of the urethra exists; plastic work to rectify this abnormal condition is often a failure, and as the function of the penis is not destroyed, operation had better be dispensed with.

Not much benefit, if any, can be gained by operative procedures in the scrotal variety of the deformity. The defect is so extensive that often the scrotum is divided in halves, the urethra opening far back in the chasm, and the penis is often defective in size and shape.

The penile variety can be remedied by plastic work, the nature of which will vary to suit the requirements of the individual case. In cases where the anterior portion of the urethra is an open groove, a useful canal may be formed by dissecting up flaps on either side of the groove, the skin of the first flap

forming the floor of the artificial canal and the raw surface of
the second flap made to rest on that of the first, its outer edge
being made fast to the skin by numerous fine catgut sutures. If
the penis is curved to a marked degree, a preliminary operation,
that of severing the skin and fascia, if found contracted, and

Fig. 300.—Nelaton's operation for episadias. The impro-
vised flap is taken from the integument of the scrotum. GG,
flap taken from the suprapubic region; F, scrotal flap; U,
the denuded dorsal surface of the penis; F, the formation
and method of application of the flap; E, base through which
nourishment is sustained.

any and all other restraining tissues, which are likely to be the
inferior portion of the sheaths of the corpora cavernosa and
perhaps the intervening septum, will have to be executed. Fol-
lowing this preliminary work, a wait of two or three months
should be allowed for the healing of the skin and other wounds.

The technic of the plastic work is briefly given as follows:
After the skin has been aseptically prepared, a longitudinal in-
cision is made about three-fifths of an inch from the median
line, on the left side, dividing skin and fascia from the glans to a
point on a line just back of the urethral opening; at each end of
the incision a short transverse cut is made to the median line;
the posterior one will end a short space behind the urethral
opening, if directions are carefully observed. This long nar-
row flap is then dissected up and back to a point near the
median line. A second flap, the same length and width, is next

dissected up from the right side of the median line, the linear incision being made a little to the right of the median line, and after the short transverse incisions are made at each end, the flap is dissected back the required distance. A sound or catheter is next introduced into the short urethra and made to rest along the median line of the penis; the first flap is reflected back over it, the skin surface being brought in contact with the instru-

Fig. 301.—A case of hermaphrodism. (*Farnum.*)

ment. The border of this flap is joined to the under surface of the base of the second flap by numerous silk-wormgut or catgut sutures passed from within outward, drawn reasonably tight, and either tied or fastened with perforated shot. With this accomplished, the second flap is adjusted over the first, the two raw surfaces resting in contact and the free margin being made fast to the outer edge of the first incision by numerous fine catgut sutures. When care is taken to cover in all raw surfaces

and unite the margins of the incision properly, suppuration seldom occurs. The wound should be dusted with iodosal or other antiseptic powder and bandaged.

Fig. 302.—Same as Fig. 301, with rudimentary penis raised, showing the perineal opening and the urethral groove; the testicles in the foids on either side. (*Farnum.*)

It is not necessary to leave the catheter in the bladder for longer than twenty-four to thirty-six hours; after that it may be inserted only when it is necessary to draw the urine. There are other methods of operation that offer some good features, but none superior to the one given in detail above for the repair of an abnormal urethral opening.

Tumors

Tumors, both benign and malignant, are not uncommonly met with in the penis. Of the former variety the warty, cystic, vascular, and sebaceous growths are the most commonly seen, although the hard, horny growth and the fibrous are occasionally encountered near the end of the penile appendage.

The cause of these growths is attributed to a lack of cleanliness, and venereal infection. The warty or papillomatous growths are especially due to the latter cause, and develop so rapidly and are so numerous as to receive the name of "cauliflower" growths.

The symptoms present during the development of benign tumors will depend entirely upon the character and location of the growth. If the prepuce is the origin of the tumor, extensive swelling and severe pain are often experienced. Papillomata, or warty growths seldom give rise to distress, but there is usually present an exudation of a foul-smelling discharge which is characteristic of the morbid state. Œdema and some degree of pain attend the formation of the cystic, fibrous, and vascular variety, especially after they are well advanced.

Of the malignant growths, epitheliomata of the squamous variety are most frequently met with. This morbid affection usually manifests itself on the edge or under the surface of the prepuce, or on the glans. Its first appearance is that of a tubercle or warty excrescence, which may soon break down into an ulcer and spread more or less rapidly. There is usually edema of tissue, more or less soreness, and pain of a lancinating character throughout the end of the penis. Soon the lymphatic glands in the groin become infected and secondary deposits in time follow. The only disease for which the cancerous growth is likely to be mistaken, is the local sore of syphilis, from which it is differentiated by the character of the growth and the history of the case.

Treatment: The treatment of cysts of the penis and other benign growths is by incision, excision, and cauterization. The operative work can be done under local anæsthesia, after the parts have been properly prepared. Potent antiseptics and sterile dressings are made use of, to complete the cure.

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When the malignant tubercle or warty excrescence manifests itself upon the edge of the prepuce, a circumcision should be done as soon as a positive diagnosis has been determined upon. The operation may stay the ravages of the disease; if not, amputation of the organ should be done, removing enough of the penis to reasonably insure a non-return of the disease. The operation is done under local or general anæsthesia, after proper asceptic preparation

The list of instruments generally required in executing this operation should include a scalpel, scissors, dressing forceps, three or more hemostats, retractors, two small tenaculums, several medium-sized curved needles, a needle holder, and several tubes of sterile plain catgut of various sizes.

To prevent hemorrhage, a rubber elastic band should be adjusted around the penis near its base. The organ should be amputated by a circular incision, so executed that the corpora spongiosum and urethra will be left projecting well beyond the surrounding tissue. The bleeding vessels are then picked up and ligated, the urethra split a half inch or more, each lateral half turned towards the corresponding side of the stump and sutured to the skin surface with the required number of catgut sutures; after the rubber band has been removed, a suitable-sized catheter is introduced into the bladder and left extending from the end of the stump, two inches or more and held in position with tape or strips of zinc oxide plaster. The stump is then dressed with sterile gauze and loosely bandaged. The wound should be redressed as often as the dressings become soiled, thus preventing, if possible, wound infection. A rubber tube of suitable size and length should be fastened to the end of the catheter to convey the urine into a receptacle placed beside the couch or bed. If the wound does well, it should be healed in a week or ten days.

PHIMOSIS

An elongated and constricted state of the foreskin, with a small orifice, is called phimosis, and is commonly met with in early life, and not infrequently in old age. The abnormal con-

dition is often congenital, but may be acquired through un-
cleanliness, traumatism and venereal disease.

A painful state of the penis, where the conditions are the
opposite of that just described, is the contraction of the orificial
margin of the prepuce back of the corona of the glans, where it
constricts the circulation, causing more or less swelling and not
infrequently ulceration and sloughing of the end of the penis.

In cases of phimosis of long standing, there is frequently
found back of the glans a thick cheesy secretion that is called
smegma. This substance may collect in such quantities as to
cause sympathetic nervous troubles, very severe in their nature.

In many cases the under side of the prepuce is found ad-
hered to the glans even to the meatus, the result of irritation or

Fig. 303.—Phimosis.

inflammatory action. Balanitis, a septic inflammatory condi-
tion of the outer structure of the glans penis, is one of the com-
plications that are sometimes met with in phimosis; it is the
result of uncleanliness and the condition should be remedied be-
fore any operative work is done on the prepuce. Other com-
plications frequently observed in connection with the abnormal
condition are cystitis, urethritis, hernia, eczematous diseases of
the skin of the penis, rectal troubles, and dilatation of the pelvic
urinary organs.

Treatment: The only treatment that will prove satisfactory
for the cure of phimosis is circumcision, which can be done under
cocaine anæsthesia, if the patient is not of a nervous and excit-
able turn of mind, otherwise a few whiffs of chloroform had
better be administered. The penis should be washed with soap

and water and bathed with alcohol. To make the operation practically bloodless, a rubber band should be adjusted rather tightly around the base of the penis, which will also prevent rapid diffusion of the cocaine, when this agent is used hypodermically for local anæsthesia. The prepuce should now be divided on its dorsal surface from the orifice to the sulcus behind the glans, either with scissors or a curved bistoury on a grooved director; the corners of the divided prepuce are then seized with snap forceps and held in slight extension while the redundant portion is cut away with scissors, being careful not to remove the entire length of the prepuce. It is the custom to leave one-fourth of the length of the foreskin. At this stage in the operation, some surgeons remove the constricting band, following which, quite a little bleeding takes place, which soon ceases, especially if the edges of the wound are compressed for a moment between the thumb and finger; others prefer uniting the edges of the skin and mucous membrane by several interrupted catgut sutures before removing the constricting band. The sutures placed in the median line on the under side of the prepuce should encircle the vessels found there, as bleeding from that portion of the foreskin is usually quite free. The vessels may require a separate ligature.

Following the placing of the sutures, the traumatic surfaces should be bathed with boric solution and a dressing of cotton or gauze applied wet in the same mixture. The wound should be redressed several times a day in young children, for the first two or three days; in adults, morning and evening.

Circumcision by the clamp method has nothing to commend it over the one just described; hence, space will not be given to its technic in this connection.

To relieve a paraphimosis, several methods are in vogue. If the morbid state is not of too long standing, the foreskin may be replaced over the glans by placing the thumbs against the end of the penis and with the first and second fingers of each hand encompassing the penis just back of the folds of integument; traction is made while the glans is forced in the opposite direction by the thumbs. In pronounced cases of phimosis in young children, and in long standing cases in adults,

the constricting bands of integument will frequently have to be divided with the knife before the misplaced foreskin can be returned to its normal position.

Not infrequently the tissues become badly distended with serum, causing a marked swelling of the foreskin; the abnormal condition soon subsides, following the return of the prepuce to its natural position.

If, in phimosis, the foreskin is found adhered to the glans penis, it must be freed by dissecting it back with the thumb nail and if smegma is found lodged behind the glans, it should be removed and the parts bathed with some antiseptic solution.

NOCTURNAL EMISSIONS

Nocturnal emissions occur as a result of a weakening of the sexual nerve centers by masturbation and excessive sexual intercourse. When the former is practiced to excess, the patient gradually becomes physically weak 'and extreme mental depression sooner or later supervenes. The seminal discharge usually takes place during heavy sleep, while the patient is lying upon his back and is usually provoked by an erotic dream or an overdistended bladder. In the course of time, a masturbating individual becomes morose, dyspeptic symptoms develop, and the bowels become constipated. Nervousness is a marked feature of the morbid state, and the patient lives in fear that sooner or later he will die from some mental disorder. The sexual organs become atrophied from abuse, and the patient imagines that he is utterly unfit for marriage and persistently shuns the society of women.

Treatment: Nocturnal emissions that occasionally occur to a healthy male, should not cause him to be mentally perturbed and do not need medicating. The mind of such an individual should be set at rest by his medical advisor and the victim of lascivious thoughts assured that, in the end, the morbid state will rectify itself with proper hygienic care. A young man having two or more emissions within a week or ten days should be put on a restricted diet, avoiding stimulating foods and drink, especially for the evening meal; meat and eggs should

be eaten sparingly, and coffee should not be drunk with the evening meal. Such individuals usually do well on milk, rice, custards, fish, chipped beef cooked in milk, the breakfast foods, ice cream, stale bread, jellies and fruits, unless the latter interfere with digestion. Soup and broths are nourishing and can be eaten freely if not too highly seasoned. The bowels should be kept open with an occasional dose of some one of the saline laxatives. At night to insure rest and freedom from exciting dreams, potent doses of bromide of soda or potash, lupulin, bromide of camphor, spc. tr. passiflora or gelsemium should be administered. During the day an occasional dose of the following prescription will be of benefit in most cases:

R.
   Spec. Tr. Hyoscyamus ....ℨ j.
   Spec. Tr. Staphisagria. ....ℨ iss.
   Peppermint Water ....-..........fl. ℨ iv.
M. Sig.—A teaspoonful every three hours during the day.

Cases due to a tenderness of the deep urethra should have full-sized steel sound passed two or three times a week for a period of a month or longer, if required; some pain will be experienced at first, but a little tact in introducing the instrument will soon overcome this.

As the seminal emissions generally take place while the individual is sleeping on his back, some means should be improvised to prevent him from remaining in this position for any length of time. Some hard object fastened to a tape or strip of cloth, adjusted around the body so that it will rest upon the back, usually accomplishes the purpose well; a large spool is commonly used for this purpose and a knotted cloth will do as well.

The individual should sleep on a hair mattress in a cool room and should not be covered too warm; he should empty the bladder before retiring and again during the night to prevent distention of the viscus.

Men with sensitive sexual organs should not handle them after retiring, or at any other time except when absolutely necessary.

Boys and even adult males having elongated and narrow preputes should have the redundant portion excised, that the

irritation provoked by the abnormal condition may be completely removed.

IMPOTENCY

Impotency signifies sexual weakness or debility on the part of the male. There are various causes for this sexual incapacity, chief among which are overindulgence in sexual intercourse, nervous ailments, the want of self-confidence, exhaustive diseases, and disordered innervation; occasionally a case will present where no cause can be assigned for the morbid state. The patient seems in the best of health, with no functional wrong that can be noted.

The symptoms vary in degree, according to the provoking cause; one class of cases will lack the power to effect an erection, and in other cases the erection will be so brief that the sexual act can not be accomplished. In other cases, the mere attempt at sexual intercourse will provoke an emission of seminal fluid; this class of cases results from undue excitement of the nervous centers that frequently follows excessive venery and habitual masturbation. With this inability to have sexual intercourse, lasting over a long period of time, the patient becomes morose and disgusted with his physical condition, and seeks relief by taking such remedies as may be recommended to him by friends or medical advisor.

In atonic impotency there is a marked want of power in the sexual organs. The testicles become soft and flaccid for the want of the proper supply of blood and the penis becomes atrophied and lifeless. The external organs not only look pale and shriveled, but they feel cold and lack the sense of feeling they should possess.

Treatment: The treatment consists in removing the cause of the sexual weakness in so far as this can be done. Restore the general health, if it seems below the normal standard, by the administration of peptics, tonics and stimulants, regulate the diet if required, advising the most stimulating and nourishing of foods. If the morbid state is due to excessive venery, have the patient abstain from sexual intercourse for a consider-

able period of time; the patient, if found moody and discouraged should be cheered up by giving him promise of a return of his sexual vigor, if he will but live right and follow directions.

As remedial agents, none give quicker relief in atonic cases than do small doses of tr. of phosphorus frequently repeated; dilute phosphoric acid in 5 to 8 drop doses in water, nitrate of strychnia in 1-60 grain doses, and tr. of cantharides in ten drop doses in a little water every 3 hours, for one day before wishing to have intercourse. These remedies, it must be understood, are only to be given in cases where the erections are so feeble and brief that the sexual act can not be completed; they are not admissible if the cause is of a constitutional nature or in senile conditions.

Neurasthenic conditions require rest and freedom from work or thoughts that worry. Riding and living in the open air with a complete change of scenery will accomplish much toward restoring health and vigor.

In long standing cases of impotency, resulting from sexual excesses, masturbation and senility, nuclein solution (Abbott's) in ten drop doses, taken in water every 2 or 3 hours, and at the same time applying the potent agent behind the glans penis several times a day, will restore virility in the majority of cases.

Remedial agents are usually given in too large doses, especially where they are required to be taken over a long period of time. The request always comes to "restore order" in the shortest possible time. Small doses of the indicated remedy frequently repeated do much better, (Abbott's aphrodisiac tonic pill, composed of strychnia hypophosphite, phosphorus, cornin, cactin, and nuclein solution is an energetic sexual stimulant and will benefit most cases if properly administered.)

The passing of graduated steel sounds once a day accomplishes a good purpose in restoring tone to the dormant nerves, especially at the neck of the bladder.

Electricity, when properly used in selected cases, often proves beneficial; the agent promptly tones up a feeble state of the external organs, giving to them a better circulation and a consequent nutrition.

HYDROCELE OF THE CORD

Hydrocele of the cord is a collection of serum in one or more places along the funicular process of the cord in the inguinal region. In this form of hernia, the process becomes obliterated above and below the collection of fluid and the tumor appears quite firm in most cases. Not infrequently the serous collection assumes an oblong shape along the course of the cord, but not so tense but what fluctuation may be noted in the majority of cases. The tumor mass nearly always rests in front of the vas and may be found down near the testicle; in fact, so close to it in some cases as to mislead the diagnosis of the experienced operator. The pent-up fluid is transparent and the accumulation can be displaced by moving the cord.

The morbid condition is incident to early childhood, it seldom appearing after the age of ten years.

There are no symptoms, except in those cases where the cyst or cysts contain a considerable amount of the serous fluid; then the patient often complains of soreness and irritation in the groin after exercising. This form of hydrocele should be differentiated from inguinal hernia, new growth of the cord, and enlargement of some one of the inguinal lymphatic glands.

Treatment: Unless complicated with some morbid condition of the inguinal canal, hydrocele of the cord, in early life soon disappears spontaneously; that is, the serous fluid becomes absorbed, the tumor disappearing. To hasten the absorption, the skin over the tumor should be painted two or three times a day with the following mixture:

R.
```
Tr. Iodine .....................................3 v
Glycerin ......................................3 iij
```
M. Sig.—For outward application.

If there is no indication of the tumor disappearing, after two or three months treatment, the fluid should be evacuated with a large hypodermic needle, after which a compress may be applied, over which a bandage should be adjusted, making the necessary compression upon the site of the tumor. A second aspiration is seldom required.

HYDROCELE

A collection of serum within the scrotum, of a greater or less quantity, is called hydrocele. In the common form of the abnormal state, the serous fluid is found within the tunica vaginalis, or covering of the testicle; the latter organ lying behind and at the lower part of the tumefaction.

Two varieties of hydrocele are usually recognized, vaginal or scrotal, and hydrocele of the cord; the former may be congenital; if so, the serous fluid may be pressed back into the peritoneal cavity, owing to the non-closure of the canal between this cavity and the tunica vaginalis.

The serous fluid is usually opaque in color, but may resemble that of coffee, should there be mixed with it a slight amount of blood. The tumefaction is usually pyriform in shape, and when of large size, causes severe dragging sensations about the hips and loins.

To the observer, the serous tumor is not unlike a scrotal hernia in appearance, a distinguishing feature being the inability to reduce the hydrocele by manipulation, while proper taxis will return to the abdominal cavity, the loop of protruding gut in inguinal hernia. The true state may also be determined by the use of a small aspirating needle, and by holding a lighted lamp opposite the tumor from the observer, while the patient is in a darkened room.

Fig. 304.—Tapping a hydrocele.

Treatment: Treatment is by aspiration, and injection of about a drachm of the tincture of iodine, using the needle as a medium, which should be of medium size. The scrotum should then be manipulated to bring the irritating fluid in contact with all parts of the serous sac; the needle is then withdrawn.

The specific tincture of thuja, and pure phenic acid, are also efficient agents used in the same way; the latter is to be pre-

Fig. 305.—Radical operation for hydrocele, (*Volkman.*)
Edges of the tunica vaginalis sutured to the edge of the skin. (*McGrath.*)

ferred on account of its anæsthetic effect; it causes less pain than the other agents mentioned. Should this method fail, open the sac under proper antiseptic precautions, and stitch the edges of the tunica vaginalis and the integument together with six or eight chromicized catgut sutures. The serous cavity is then loosely packed with iodoform gauze, which will supply a means of drainage, and keep the wound in a sterile condition; the scrotum is then loosely bandaged and the patient kept in bed for a

week or ten days, at the end of which time the ligatures are removed, the wound antiseptically dressed once a day, and the scrotum kept suspended. The patient will be up and about in three weeks, but the suspensory should be worn for at least two months.

Should abscess formations result from the use of the caustic agents injected into the sac, open the scrotum and drain, following with antiseptic washes and dressing. The method of cure by injection should not be resorted to in congenital cases, or those complicated by tumors, and old age. Care should always be taken not to withdraw the canula or needle outside of the sac previous to introducing the irritating fluid, otherwise it is deposited in the scrotal tissue and sloughing is likely to result. Incision with drainage, and subsequent antiseptic dressing, is the only safe method in congenital cases, if the wearing of a properly fitted truss fails to obliterate the canal. Cutting down upon, and tying off the neck of the sac also affords a justified method of procedure. It is not uncommon for a hernia and a hydrocele to be present at the same time in congenital cases.

URETHRITIS

Urethritis is an inflammation of the urethra, and is provoked by many causes, chief among which may be mentioned traumatism, infection resulting from gonorrhœa and syphilis (specific urethritis); calculi or other foreign bodies, stricture, masturbation, irritant drugs, such as cantharides and turpentine; alcoholic excesses and contact with acrid leucorrheal discharges.

The symptoms attending this morbid condition will depend largely upon the direct or exciting cause. When due to traumatism, the inflammatory action will follow within a few hours; when due to other causes mentioned the stages of **incubation** will vary.

The early symptoms noted are heat, redness, and swelling about the meatus, frequent urination with more or less smarting and burning, tenderness along the urethra upon pressure, and painful erections; secondary symptoms are manifested by a discharge of mucus or muco-pus, sometimes tinged with blood, uri-

nary deposits or concretions, and in connection the presence of parasites and foreign bodies. when these are the exciting cause.

When the local disease is due to gonorrhœa (specific urethritis) **ardorurinæ** is a marked symptom, appearing five to eight days after a suspicious intercourse. Chordee may also be a troublesome feature, when the urethritis results from specific infection, as will tenderness of the inguinal lymphatic glands in most cases.

Treatment. Prompt results from treatment will depend largely upon the cause of the disease. When due to causes other than specific infection, early relief may be expected from rest, occasional sips of a five per cent. solution of sulp. of magnesia, the avoidance of stimulating foods and drinks, and keeping the bowels open with an occasional dose of Epsom or Rochelle salts. The following prescription will act kindly in most cases·

> ℞.
> Spc. Tr. Aconite ....gtt. x.
> Spc. Tr. Gelsemium ....ℨ ss.
> Spc. Tr. Eryngium ....ℨ j.
> Aqua Dest., q. s. ....fl. ℨ iv.
> M. Sig.—A teaspoonful every hour.

Cases due to specific infection will require urethral injections of some one of the potent antiseptic solutions in connection with the internal medicines mentioned above. Water as hot as can well be borne is comforting. and should be used every two or three hours; a few grains of biborate of soda added increases its potency. After the acute inflammation has subsided, the character of the injections may be changed: a solution of aromatic sulphuric acid (5 drops to the ounce) serves a good purpose here, as does a five per cent solution of argyrol. If local irritation is provoked by the use of these agents, their use should be suspended for a few days, and the hot boric solution continued.

Local pain may require the application of hot fomentations to the perineum at the outset of the treatment. Chordee will be relieved by injections of hot water, keeping the bowels unloaded, avoiding a stimulating diet, and an occasional dose of bromide of soda or potash during the day, and five to ten grains of monobromated camphor in emulsion at bed time. Camphor gum held in the mouth during the early part of the night impresses the nervous

system with a sedative effect. The patient should sleep on a hair, or at least a hard mattress, with light covering, he can drink freely of water, milk, slippery elm water and buttermilk; late suppers should be avoided and regular hours for rest and sleep maintained.

Traumatism and the presence of urethral calculi will require surgical intervention, the nature of which each individual case will have to determine.

CIRCUMCISION

Circumcision is the removal of a portion of the foreskin when abnormally long or too tightly contracted about the glans penis. In either case smegma and other foul secretions find lodgment behind the corona glandis, producing a local irritation that often sets up a train of nervous symptoms affecting the physical well-being of the patient.

Several methods of removal of the prepuce are put in practice by surgeons, two of which will be noted here: First, the division of the foreskin on the dorsal side, back as far as the corona, in those cases where it is too contracted but not abnormally long; and the cutting away of the redundant tissue in
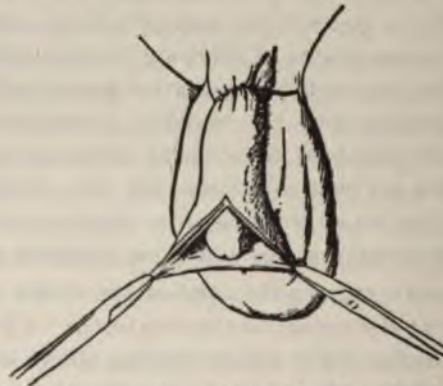
Fig. 306.—Circumcision. A small rubber band has been adjusted around the penis to lessen hemorrhage, and the foreskin has been incised with a knife or scissors. The corners of the divided prepuce are seized with artery forceps, preparatory to trimming it away with scissors. (*McGrath.*)

those cases where the prepuce is not only contracted but extends a half-inch or more beyond the end of the penis.

It will be necessary to administer a general anæsthetic to children and very nervous individuals before executing the work, while others can have the operation done under local anæsthesia. A four per cent solution of novocain or cocain, with adrenalin chloride solution added, being the anæsthetic agents used for the purpose.

After the penis has been washed with borax water, two or three turns of a small rubber strand should be tightly adjusted about the root of the penis and tied as noted in the accompanying cut. The dorsal section is then made, after which the corners of the divided prepuce are picked up with artery forceps and a slight traction made, while the redundant tissue is cut away with scissors. The edges of the skin and mucous membrane are then approximated and fixed with fine catgut sutures, by the interrupted or continuous method.

Fig. 307.—Circumcision. The margins of the skin and mucous membrane united with catgut, after the redundant portion of the foreskin has been removed.

The rubber strand should next be loosened, and if hemorrhage follows the immediate margins of the wound should be firmly compressed between the thumb and finger for a moment, when it usually ceases.

It is the rule to leave about one-fourth the length of the prepuce, as the post-operative contraction generally brings the remaining portion back of the corona.

In trimming off the redundant portion of the foreskin it is not advisable to cut through the frenum, as quite active hemorrhage follows the wounding of it; besides it is slow in healing and more or less painful.

Some operators make use of the clamp in removing the foreskin. Dr. Holton, of Los Angeles, Cal., has devised graded

rings, three in number, the use of which he claims simplifies the operation along all lines. But the method above described is so simple and easy of execution that it seems a waste of time to resort to either the clamp or ring method.

Following the operation the wound should be bathed with a weak solution of biborate of soda; also after urination, to prevent, if possible, irritation or infection of the traumatism. The end of the penis may be secured in a gauze bandage to prevent irritation from the undergarments.

CANCER OF THE PROSTATE

Cancer of the prostate is of quite common occurrence. It may appear as a primary growth or it may follow a hypertrophied state of the gland. Many cases of hypertrophy of the gland of long standing will present evidences of malignancy at some point in the stroma, as can be determined by subjecting a section of the diseased tissue to a microscopical examination. Unless the cancerous state is far advanced, a correct diagnosis cannot be settled by the usual forms of a clinical examination.

The morbid growth is of rather slow development and is generally observed in men of middle age and advanced life.

The characteristic symptoms of cancer of the prostate are a nodular enlargement of the gland, distress and pain in the region of the neck of the bladder, accompanied with frequent desire to urinate, which action is attended with more or less tenesmus, caused by the partial obstruction of the urethra. The malignant disease should be differentiated from simple tumors and senile hypertrophy of the glandular structure, if possible, in forming a diagnosis.

Treatment: The treatment consists in the removal of a part or all of the prostate gland, if the case is seen early; otherwise the urinary viscus will have to be drained through the perineum or above the pubic bone, which will give temporary relief, the best that can be hoped for in advanced cases of the disease.

CASTRATION

The removal of the testicle is often required in disease of that organ. As a rule the operation is not difficult of execution. After the scrotum and pubic region have been properly prepared, an incision is made in the soft parts along the line of the spermatic cord, extending from a point near the pubes to another near the bottom of the scrotum. After exposing the cord and testicle, the latter should be lifted out of the scrotal wound and securely held, while the organ and cord are dissected free from the areolar tissue surrounding these structures. The envelope of the cord is next slit open, exposing the vas deferens and blood vessels accompanying it, both of which should be ligated separately with silk or catgut rather high, so that after severing the tissues composing the cord, the stump will retract above the pubic bone. As the operation is usually done on account of malignant or tubercular disease of the testicle, opening the canal well upward gives the surgeon an opportunity to dissect away any morbid tissue discovered along the track of the cord.

After the removal of the testicle, the margins of the wound should be approximated and sutured with ten-day catgut, leaving a vent in the lower angle of the wound for drainage, otherwise the scrotum is likely to fill up within a few hours with bloody serum.

At the conclusion of the operation, it will be well to inclose the scrotum with a layer of absorbent cotton, which should be held in place with a few turns of a roller bandage, and the patient enjoined to keep at rest in bed for a few days. Subsequent dressings should consist of bathing the parts involved with antiseptic washes and the application of sterile gauze pads and bandages. With no complications the wound should heal in ten days to two weeks.

EPIDIDYMITIS

Epididymitis is the result of gonorrheal inflammation of the urethra, or injuries to the testicle, inflicted by kicks, blows,

and from other forces, sufficiently severe to set up an acute inflammatory action. The affection is characterized by pain of an intense and sickening character, and extreme tenderness along the course of the spermatic cord, with dragging and aching across the small of the back, hips, and pelvis. Injury to the deep prostatic urethra, by the passage of bougies and steel sounds, and the pressure occasioned by the impaction of an imbedded calculus, are common causes of inflammation of the epididymis.

Treatment: The treatment consists in removing whatever the exciting cause may be, in so far as this is possible. The patient should rest in bed; the scrotum should be wrapped in cloths wet in laudanum, witch-hazel, and water in the following proportions:

R.
Laudanum .... ℥ j
Witch Hazel .... ℥ ij
Warm Water, q. s. .... O j

M. Sig.—Apply as hot as it can be comfortably used, and support the testicles on a hot water bag, or other suitable support.

This application affords an efficient fomentation, and is useful in all acute cases, and as there is usually more or less fever present, give teaspoonful doses every hour or two of:

R.
Spec. Tr. Aconite .... gtts. x
Spec. Tr. Pulsatilla .... ℥ ij
Spec. Tr. Macrotys .... ℥ ss
Peppermint Water, q. s. ....fl. ℥ iv

The bowels should be kept loose with saline laxatives, and demulcent infusions ordered to be drunk freely. After the acute symptoms have subsided, the testicle should be strapped, and subsequently a suspensory bandage should be worn. Severe pain can be relieved by the use of the anodyne suppository mentioned in the treatment of gonorrhea, and sleeplessness will call for a dose of chloral at bed-time. Should suppuration take place, incise and drain, and treat the wound with antiseptic washes.

EPIDIDYMECTOMY

The removal of the epididymis is sometimes required on account of the presence of tumors and tuberculous disease of the organ. After the scrotum has been washed with soap and water and otherwise aseptically prepared, a drachm or more of a four per cent solution of novocain should be introduced into the scrotal wall along the proposed line of incision with a hypodermic needle. A like amount may be thrown into the epididymis with a long needle through the wall of the scrotum or the organ can be injected after the scrotum has been opened.

After the tunica vaginalis has been opened, exposing the epididymis, the organ should be seized with forceps and carefully dissected free from the testicle with the point of blunt scissors, snipping any opposing fibrous bands that may appear to retard the work. With the spongy body removed, all bleeding vessels should be picked up and secured, the wound then cleared of clots and fluids should be closed with catgut sutures with provision made for drainage, extending into the tunica vaginalis.

The patient should rest quietly in bed for two or three days with the scrotum bandaged. The drainage material should be removed the second day if all goes well.

PART TWENTY-ONE

Amputations

Amputation of the limbs is required to save life, to preserve a serviceable stump if possible in traumatic injuries where much of the tissue is destroyed, and to rid the system of destructive morbid states and incurable and unsightly deformities. The most satisfactory results follow the operative work when careful antiseptic technique is observed throughout the entire procedure.

Amputations are classified, as regards to time of operating, into immediate, primary, and secondary; and the ratio of fatalities following the operation is usually in the order named. Severe crushing injuries of the extremity, followed by a great loss of blood and shock, frequently require **immediate** amputation; if the patient's condition is such that a sufficient time can elapse to permit the recovery from shock the **primary** operation is then executed; the **secondary** amputation is done following the occurrence of inflammatory action.

If amputation is done through the bone it is in continuity of bone structure; if executed through an articulation it is said to be in contiguity. The latter method is also spoken of as operation by disarticulation, which is resorted to in order to save as much of the extremity as possible, the operator bearing in mind the fact that to operate through a joint increases the liability to postoperative complications.

Of the various methods of amputation, three are recognized as possessing merit, the circular, the flap operation in which the tissues overlying the bone are included in the transfixation; and the oval, or modified flap operation, in which a cuff of skin and subcutaneous tissue is dissected back a sufficient distance to cover the end of the stump after the muscular structures have been

divided on a level with the point at which the bone is severed. Any one of the above methods of operation will of necessity have to be modified occasionally to meet the requirements in fashioning the necessary flaps from available tissue in badly lacerated wounds.

In order to be well equipped for the operative work the surgeon will need to have at hand rubber bandages, rubber elastic tourniquets, several bistouries and scalpels, saws, cutting bone forceps, retractors, bone holding forceps, dissecting forceps, tenacula, hemostatic forceps, scissors, sutures, ligatures, needles of assorted sizes, needle-holder, material for drains and splints, long steel pins for Wyeth's bloodless operation of the hip joint, and a liberal amount of sterile dressings.

The successive steps followed in amputating a limb by any one of the three methods previously mentioned, will be given when describing the technique of amputations in the different portions of the extremities. The patient should be prepared for an amputation the same as for any other operative work, if time permits; special attention being directed to the examination of the urine. The bowels are to be moved by broken doses of sulph. of magnesia, the body and especially the · limb is to be thoroughly cleansed with an alkaline bath, and the immediate condition of the pulse, respiration, and the temperature of the body noted. If time will permit, no food should be taken for six to ten hours previous to the operation, which should be done under chloroform anæsthesia, and in the shortest possible time.

In every amputation the aim of the surgeon should be to save as much of the injured limb as possible, but at the same time ample provision must be made for sufficient sound tissue to make a good stump free from contracted cicatrical tissue, which is responsible for a restricted circulation and pressure irritation. Provision should always be made, when possible, to so locate the cicatrix that the wearing of an artificial limb will not produce undue irritation.

After transfixing the muscular tissue the ends of the severed arteries are picked up and tied close to sound tissue, and at a safe distance from important branches that the formation of a clot will not be interfered with. The nerve trunks should be cut short that they may not become involved in the cicatricial tissue

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divided on a level with the point at which the bone is severed. Any one of the above methods of operation will of necessity have to be modified occasionally to meet the requirements in fashioning the necessary flaps from available tissue in badly lacerated wounds.

In order to be well equipped for the operative work the surgeon will need to have at hand rubber bandages, rubber elastic tourniquets, several bistouries and scalpels, saws, cutting bone forceps, retractors, bone holding forceps, dissecting forceps, tenacula, hemostatic forceps, scissors, sutures, ligatures, needles of assorted sizes, needle-holder, material for drains and splints, long steel pins for Wyeth's bloodless operation of the hip joint, and a liberal amount of sterile dressings.

The successive steps followed in amputating a limb by any one of the three methods previously mentioned, will be given when describing the technique of amputations in the different portions of the extremities. The patient should be prepared for an amputation the same as for any other operative work, if time permits; special attention being directed to the examination of the urine. The bowels are to be moved by broken doses of sulph. of magnesia, the body and especially the · limb is to be thoroughly cleansed with an alkaline bath, and the immediate condition of the pulse, respiration, and the temperature of the body noted. If time will permit, no food should be taken for six to ten hours previous to the operation, which should be done under chloroform anæsthesia, and in the shortest possible time.

In every amputation the aim of the surgeon should be to save as much of the injured limb as possible, but at the same time ample provision must be made for sufficient sound tissue to make a good stump free from contracted cicatrical tissue, which is responsible for a restricted circulation and pressure irritation. Provision should always be made, when possible, to so locate the cicatrix that the wearing of an artificial limb will not produce undue irritation.

After transfixing the muscular tissue the ends of the severed arteries are picked up and tied close to sound tissue, and at a safe distance from important branches that the formation of a clot will not be interfered with. The nerve trunks should be cut short that they may not become involved in the cicatricial tissue

during the process of healing; and the periosteum should be cut on a line with the severed bone, which must be severed transversely and sufficiently high that the soft structures composing the flaps will readily cover it in. The oozing of blood from divided muscular surfaces is controlled by clamping the severed ends of vessels that will not contract under the application of hot sterile water.

Amputation of the Fingers·

A portion or all of a finger should be removed at once if the diseased condition or traumatism be of so serious a nature that the part saved will be unserviceable; but the rule is to save as much of a digit as possible not only for service but for its cosmetic effect. In making the incisions to form flaps they

Fig. 308.—Amputation of the finger.

should be so arranged that they will not bring the cicatrix on the flexor surface, hence when it is possible the flap should be made from the palmar surface of the finger. Felons and other morbid states, as well as injuries to the distal phalanx may require a disarticulation at the middle or last joint, which is execut-

Fig. 309.—Making anterior flap in disarticulation of the finger at the middle joint.

ed by first retracting the soft structures to a moderate degree and then cutting down upon the joint from the dorsal side, using a bistoury to do this part of the work. After the knife has passed through the joint its edge is made to hug the bone in the severed phalanx and made to cut forward a sufficient distance to form the anterior flap, which if properly fashioned is brought back

over the end of the disarticulated bone and joined to the edge of the dorsal flap by three or more sutures of catgut.

The external wound may be dusted with some potent antiseptic powder and dressed with strips of sterile gauze. The wound should be redressed as often as the post-operative conditions will require. The arterial branches on either side of the finger will as a rule require tying, although the application of a clamp for a few seconds is usually all that is required to control any active hemorrhage.

To amputate the fingers in continuity does not require a different technique than the course mentioned above, except that the bone is either severed with a phalangeal saw, or bone forceps at the point of election.

To amputate or disarticulate the finger at the metacarpophalangeal joint is executed by making the dorsal incision from a point about one half inch above the apex of the knuckle and carried forward on the median line to a point on a level with the web between the fingers, dividing all of the soft tissue down to
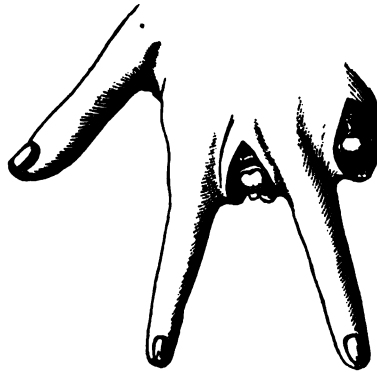
Fig. 310.—Amputation of the middle and little fingers at the metacarpo-phalangeal articulation.

the bone. From the anterior point of this linear incision another is made entirely around the finger dividing all the soft structures to the bone. All of the soft tissue above the circular incision is now dissected back to the joint which is disarticulated by flexing the finger and cutting the lateral ligaments when it may be removed. After the finger is removed the bleeding points are

Fig. 311.—Amputation of the middle finger at the carpo-metacarpal articulation.

Fig. 312—Margins of the wound closed with catgut.

picked up and ligated, the edges of the flaps approximated and sutured with the necessary number of catgut strands and the external wound dressed with antiseptic powder and sterile gauze. In all cases the hand had better be suspended in a sling for a week or two which will aid, in a measure, in relief from pain.

To improve the appearance of the hand in cases of amputation of either of the two middle fingers at the metacarpo-phalangeal joint, the bulbous end of the metacarpal bone from which the finger was disarticulated is removed to the extent of about one inch. To execute this work the first dorsal incision should ex-

Fig. 313—Amputation of the thumb at the carpo-metacarpal articulation.

tend upwards from the knuckle for about one and one-half inches along the line of the metacarpal bone dividing all of the soft structures overlying the bone. With a sharp bistoury the tissues are separated from the bone, being careful not to wound the ad-

Fig. 314.—Wound united, linear cicatrix.

jacent vessels, which can be prevented by keeping the edge of the knife always pressing against the bone. The bleeding vessels are picked up and tied and the flaps, which are shorter than in the other form of operation, are united with four or five catgut sutures.

Amputation Through the Hand

In crushing injuries where all of the fingers down to the metacarpo-phalangeal joint are involved and perhaps the distal ends of the metacarpal bones, amputation at the metacarpo-phalangeal articulation will be required, and is executed by making the dorsal incision about one-half inch in front of the knuckles extending from the fore-finger to the outer side of the little finger, dividing all of the soft structures down to the bone; this
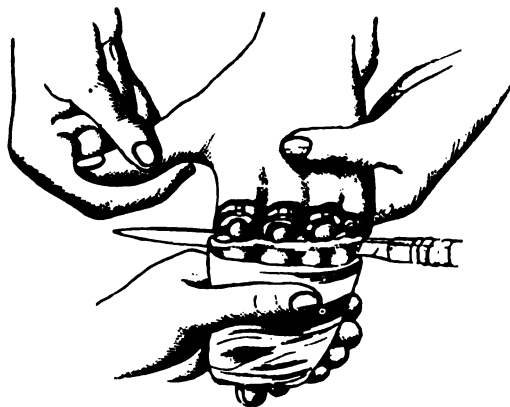
Fig. 315.—Amputation of the hand at the metacarpophalangeal articulation.

dorsal flap is dissected back to the knuckle joints, the lateral ligaments severed and the fingers disarticulated by pressing them forcibly inward; a long slender knife is then inserted behind the bases of the phalanges and made to cut forward, keeping the edge against the palmar surface of the bones of the fingers, until

Fig. 316.—The amputation completed, showing flap.

Fig. 317.—The flaps closed with catgut sutures.

on a line with the web between the fingers when its edge is turned outward and made to cut its way out, thus forming the anterior or palmar flap which is properly trimmed, the bleeding vessels picked up and tied, and then turned up and back and joined to the dorsal flap with several catgut ligatures. The operative surfaces are bathed with some potent antiseptic solution and the stump dressed with sterile gauze.

Amputation of the Hand at the Carpo-Metacarpal Articulation.

Amputation of the hand at the carpo-metacarpal joint is resorted to in traumatic injuries involving the hand and fingers and where an effort is made to save the thumb. Preceding the operative work in this, as well as in other amputations, the operative field should be rendered thoroughly sterile by washing and scrubbing the skin surface with soap and water, bichloride solution 1-2000, followed by the alkaline wash or sterile water. The hand is then supinated and a slightly curved incision made across the palm from left to right extending from the outer edge of the hand to the web between the thumb and fore-finger, dividing all of the soft structures down to the metacarpal bones. The convexity of the incision is forward or toward the fingers, and about one half inch above the articular ends of the metacarpal bones.

A curved incision is now made across the back of the hand the ends of which connect with the extremities of the palmar incision, dividing the skin and fascia to the bones. The dorsal and palmar flaps are now dissected back to the junction of the carpo-metacarpal bones, which are disarticulated by first cutting the lateral ligaments and forcibly bending the hand forward and inward, displacing the metacarpal bone of the fore-finger last, using due care not to open or injure the tussues above the carpal articulation of the metacarpal bone of the thumb. The bones removed, the arterial branches are picked up and tied, the edges of the flaps united with catgut ligatures, the hand cleansed of bloody discharges and dressed with sterile gauze.

Not much blood will be lost during the operative procedure, especially if the rubber tourniquet has been tightly adjusted about the wrist at the commencement of the operation.

Amputation at the Wrist Joint.

To amputate the wrist by the circular method an assistant grasps the forearm above the wrist and draws the integument toward the elbow, at the same time steadying the arm while the surgeon makes a sweep transversely around the wrist with a small amputating knife, about one half inch below the styloid process of the radius, dividing the soft structures down to the bone. The skin and underlying soft tissues are then dissected upward to the radio-carpal articulation, the cuff retracted, the ligaments about the joint incised and the disarticulation completed by the knife while the hand is depressed and forcibly extended from the arm. The ulnar and radial arteries are now to be found and ligated, the stump cleansed with sterile water, the edges of the flaps approximated and united with catgut sutures which should be placed about one half inch apart. The surface is then dusted with antiseptic powder and the stump covered in with sterile gauze bandages. Preceding the operative work the patient is anæsthized and an Esmarch's elastic bandage run on the fore-arm to control hemorrhage. It will be well to cut the ends of the divided nerves and tendons short before closing the flaps that they will not become involved in the healing process, as otherwise a painful state of the stump may remain for some time following the operation.

Amputation through the Forearm.

Amputation of the forearm is done in the lower, middle, or upper third as the surgeon may elect, to meet the requirements in diseased conditions, or traumatic injuries. In order to preserve the movements of the forearm, the amputation should be below, the insertion of the pronator radii teres, if the morbid state for which the operation is done will permit. The circular method is preferred by most surgeons to the anterior-posterior flap method, especially for the lower third of the forearm.

Fig. 318.—The application of Esmarch's bandage and cord, preparatory for amputation of the fore-arm.

Before commencing the operative work the forearm should be thoroughly scrubbed with soap and water, followed by some potent antiseptic solution, and then by sterile water. With the patient anæsthetized and the arm extended over the edge of the table and steadied by the assistant, in a supinated state, the tissues are divided with a long amputating knife by a circular incision at a point a little more than one fourth of the circumference of the limb at the point where it is desired to sever the bone. The cutaneous cuff or sleeve is dissected up and turned back to the point where it is desired to saw off the bones, which is done by placing the heel of the saw upon one of the bones and drawing it backward while holding it firmly. A groove will

be formed from which both bones should be severed, care being taken that the last cuts of the saw do not splinter the osseous structure. It will seldom be necessary to hold the soft structures back with a cloth retractor while the bones are being severed, as the assistant can accomplish this act while steadying the arm.

After the injured portion of the arm has been removed the stump should be inspected, and all loose shreds of periosteum and spiculæ of bone remaining to delay the healing process should be cut away. If the rubber tourniquet has been proper-
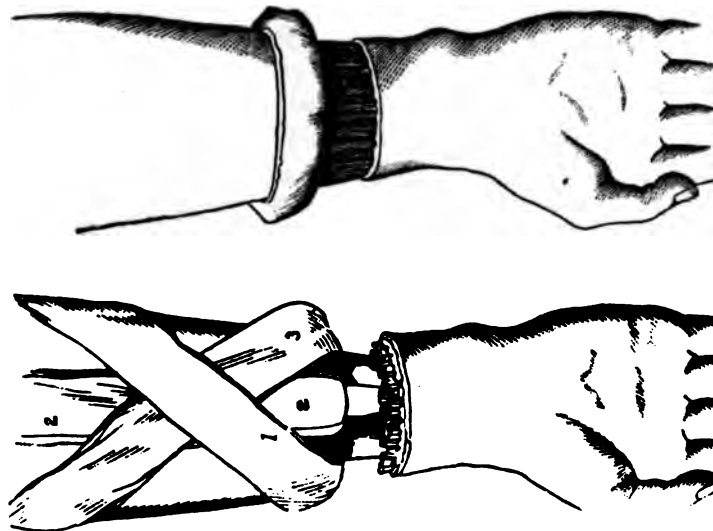
Fig. 319.—Circular amputation of the fore-arm, with three-tailed retractor placed.

ly adjusted above the site of operation at the outset, little blood will be lost during the operative work. The ulnar and radial arteries are picked up and tied and the cutaneous cuff turned back into place, the edges approximated and fixed with numerous catgut sutures, the stump washed with sterile water and dressed with sterile gauze, and placed at rest upon a pillow or cushion with the patient in bed for a few days.

To amputate the forearm through the middle or upper third, the same preparatory technique should be observed as was advised in operation through the lower third. As the forearm is composed of more muscular tissue in these divisions, amputations

are done by both the circular and anterior and posterior flap
methods. The circular method is principally favored by most
operators, although more or less difficulty is met with in efforts
to dissect up the cutaneous cuff occasioned by the muscular
enlargement of the forearm as the elbow is approached, and the
distal end of the cutaneous sleeve being too small to permit of
its being reflected back, unless it is slit up to the extent of one
or two inches, which is usually done.
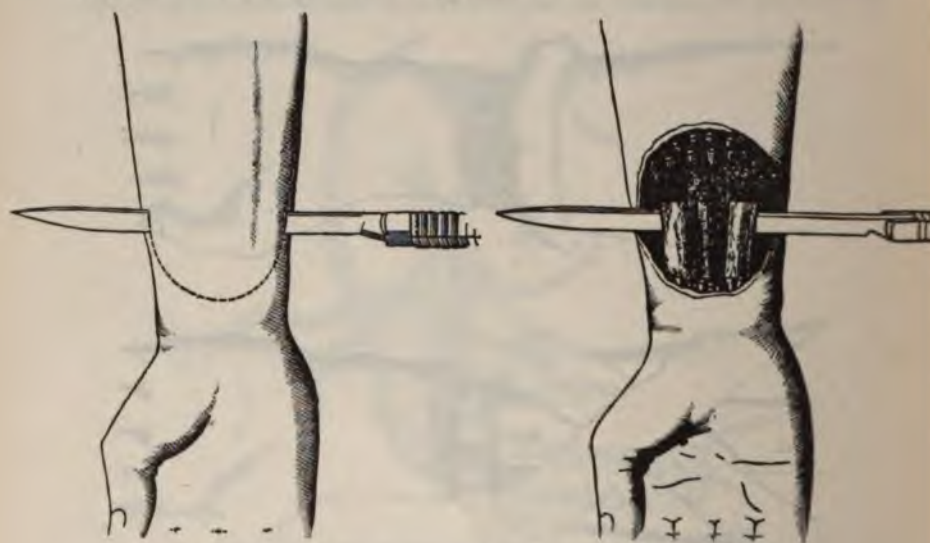
Fig. 320.—Anterior and posterior flap operation of the fore-arm.

The circular flap should be of a length equal to one fourth
of the circumference of the arm at the point at which the bones
are to be severed. The muscular structure is cut through by
circular sweeps of the amputating knife, commencing one half
inch or so below the point at which the sleeve has been retracted.
After reaching the bones the interosseous tissue should be divided
with a scalpel, care being taken not to sever the blood vessels so
high that their retraction within the tissues will make it difficult
to pick up the divided ends and tie them. The soft tissues all
divided, their surfaces are retracted with a cloth three-tailed
retractor to the point where the bones are to be severed, which
is done by commencing upon the radius and passing over on to

the ulna before the radius is completely divided. The tissues all divided and the blood vessels secured by ligature, the cutaneous sleeve is returned and its edges secured with catgut sutures after making provision for drainage. The wound is then washed with some antiseptic solution, and the stump dressed in the usual way and placed at rest.

Amputation at the Elbow Joint.

Amputation of the arm at the elbow joint is done where the forearm is extensively diseased, and in badly mangled or lacerated injuries. The operation is entirely feasible at this point but more or less difficulty often follows the operation from the projection of the humerus in the wound unless ample provision is made for flap tissue to cover it in. Several methods of cutting the necessary flaps have been advised by different operators, each possessing some feature of merit, but the circular flap method is largely favored by surgeons of extensive experience along this line of work.

After the arm has been rendered aseptic and the patient placed under an anæsthetic, an Esmarch's rubber bandage should be run on, to a point a few inches above the articulation where a few turns of a rubber tourniquet will restrict the circulation during the operative work. With the arm extending from the opating table and steadied by the assistant, a circular incision is made with a long amputating knife at a distance below the joint or point immediately above the condyles at which the humerus is to be severed, equal to three fourths of the diameter of the arm at the point of section; the incision extends to the deep fascia only, the tegumentary sleeve is then dissected upwards as far as the intended division of bone, at which point the soft structures are all divided, the lateral and anterior ligaments are then severed when disarticulation of the elbow is completed, dividing the tendon of the triceps close to the olecranon at the last.

If it is decided to sever the humerus just above the condyles, the soft tissues are dissected up a little higher than for disarticulation, and retracted well with a slit cloth retractor, the humerus sawed through about one and a half inches above the articular surface, the edges examined for spiculæ of bone that sometimes remain as a result of the last ⅟   ɪll loose

pieces of ligament trimmed away. The bleeding vessels are then secured by ligature, following which the cutaneous sleeve is turned into position, its edges approximated and fixed with numerous catgut sutures, first having made provision for drainage by placing a piece of perforated rubber drainage tubing across the end of the stump next to the bone and extending a half inch from the extremity of each lateral incision. The stump is then cleansed of all discharges with a weak bichloride solution and wrapped in sterile gauze and bandaged. The drainage tube should be left in place for one or two days when it should be removed. The stump should be douched with a weak solution of bichloride at each daily dressing until all discharges disappear.

It will be well for the patient to rest in bed for a few days until the period of shock and traumatic fever has passed. Little can be said in favor of the lateral, or anterior and posterior flap methods of amputation at the elbow joint; it may be feasible in some cases, but the course has nothing to commend it over the circular method when properly executed.

Amputation of the Arm.

Amputation of the arm is usually done at any point below the attachment of the shoulder muscles; above this point there is nothing to commend the amputation over a disarticulation at the shoulder joint. As the humerus is well covered with muscular structure on all sides, any one of the recognized methods of amputation may be employed with reasonable degree of success.

Fig. 321.—Amputation of the humerus in the middle third.

The circular method is adopted more frequently than the flap method and is executed as follows: After the arm has been rendered sterile and the circulation cut off by the adjustment of the Esmarch's bandage and rubber tourniquet, the patient thoroughly anæsthetized, a circular incision is made with a long amputating knife through the skin, superficial fascia down to the deep fascia, at a distance from the point at which the humerus is to be severed, equal to three fourths of the diameter at the point of division. The sleeve including the skin, cellular tissue, and superficial fascia, is dissected up and reflected back upon the arm to the point at which the section of bone is to be made, the muscular tissues divided with the amputating knife to the bone, which is severed with the amputating saw close to the retracted tissue. Before sawing off the bone it is well to make a circular incision of the periosteum with the knife at the point at which the saw is applied, that its structure be not lacerated by the saw beyond the point of division of the humerus.

The amputation completed, the stump is examined for the presence of loose shreds of tissue or sharp points of osseous material, which if found should be cut away. The blood vessels are then picked up and ligated, the cutaneous cuff turned into place, a rubber drainage tube placed in the wound and the edges of the circular flaps united with catgut sutures. The stump after being cleared of discharges is wrapped in sterile gauze and bandaged. It may not be necessary to leave the drainage tube in place for longer than a day or two, when it is removed and the stump redressed with sterile solutions and dressings once a day for a week or two, or till the healing process is complete.

Amputation at the Shoulder Joint

Amputation at the shoulder joint is quite easy of execution, not especially dangerous, and the result the most successful of the major operations. Several operative methods are in favor with surgeons, all possessing some merit; the one is usually chosen, however, best suited to deal with the morbid state requiring the amputation. The method of disarticulation that gives excellent results if properly executed is as follows; After the parts have been rendered aseptic by washing with soap and water and some potent antiseptic solution, and sterile water,

the patient is anæsthetized and placed on the table with the shoulder overhanging the edge, with the arm slightly rotated outward and carried away from the body to the extent of six inches or more. The first incision is commenced a little internal to the outer end of the clavicle and extends downward and slight-
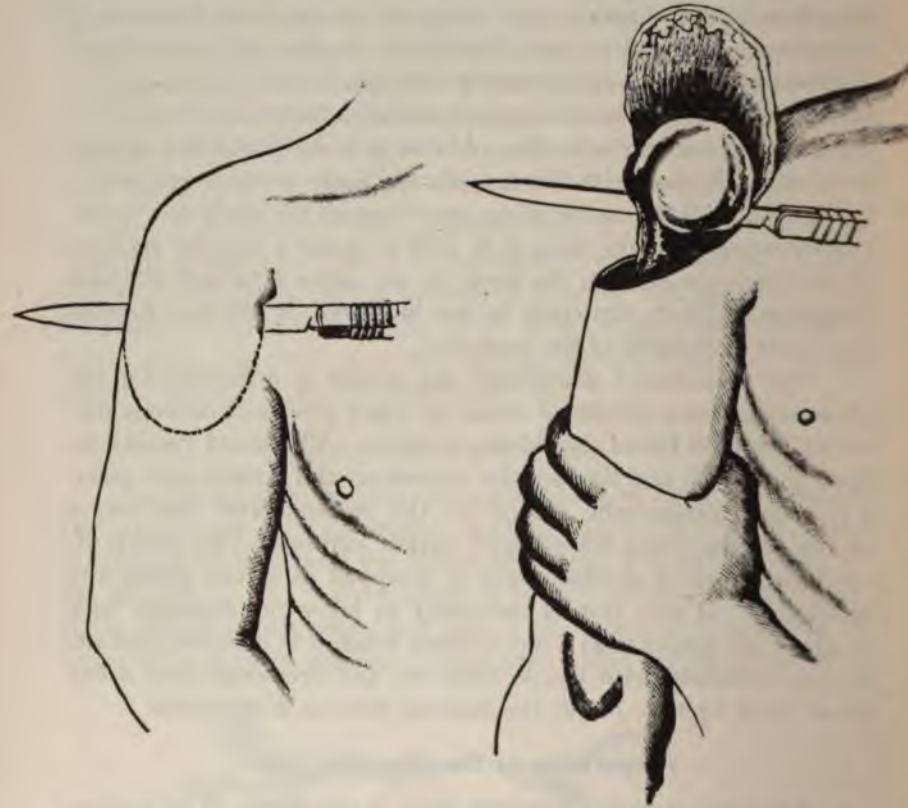
Fig. 322.—Flap amputation at the shoulder joint. Laying out the flap.

Fig. 323.—Flap amputation at the shoulder joint. Excising the joint.

ly outward to the point of attachment of the deltoid muscle to the humerus. This incision will be about six inches in length and should divide all of the soft structures down to the bone. Then with the long amputating knife a circular incision is made around the arm at the lowest extremity of the first incision dividing only the skin, fat, and superficial fascia, carefully avoiding

the important vessels on the inner aspect of the arm, but extending to the bone on all other sides. The next step will be to dissect the soft parts from the bone on the outer side of the humerus above the circular incision to the articulation with a scapel, at the same time rotating the arm inward to aid in bringing the posterior part of the upper end of the humerus into view. After exposing the capsular ligament it is opened by cutting directly down upon it on a line with the head of the humerus, working from behind forward, keeping the edge of the knife turned to-
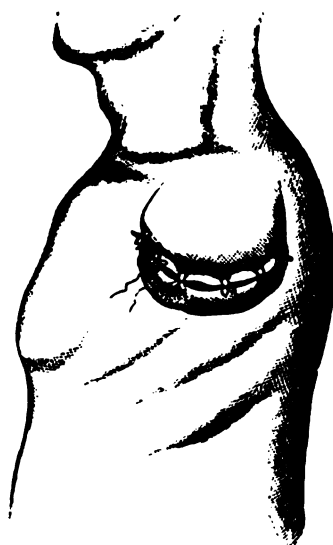
Fig. 324.—Flap amputation at the shoulder joint. Closing the flap, with sutures in place.

ward the head of the humerus to prevent wounding the important vessels and nerves lying on the inner side of the bone. Considerable force can be displayed by the assistant by extending and rotating the humerus inward and outward while the surgeon severs the ligaments that hold the head of the bone in its socket, including the long tendon of the biceps. After the disarticulation has taken place the knife is introduced behind the head of the humerus and made to divide the remaining soft structures to a point a little below the circular incision; and in doing this the edge of the knife should be kept close to the surface of the hu-

merus until it reaches the point of the division of the circular incision, when it is made to cut its way outward dividing the remainder of the muscular tissue containing the brachial vessels and nerves. If no other provision has been made to control hemorrhage, the assistant grasps the soft tissue mass containing the vessels and compresses it firmly before it is severed and after till the operator picks up the severed ends of the bleeding arteries and securely ties them with fine silk or catgut. The wound is thoroughly inspected, and all loose tissue trimmed away, the bleeding points secured, provision is made for drainage and the edges of skin flaps approximated and secured with numerous interrupted catgut sutures. The external surface of the stump is freed from blood and other soilings and dressed with sterile gauze. The drainage tube should remain in place for three or four days when it can be removed, the drainage thereafter taking place through the opening between the flaps where the tube rested. The wound should be redressed daily with weak antiseptic solutions during the period of inflammatory action, and should be healed in three weeks, if no complications arise.

In amputation at the shoulder joint by what is known as the bloodless method, the Esmarch's rubber bandage or cord is passed through the axilla and up over the shoulder by two turns and secured by a knot; and to prevent its slipping from its position during the operative work, a long needle is inserted deeply, near the tip of the coracoid process and forced backward and made to emerge posteriorly near the outer border of the scapula. If the morbid state for which the amputation is executed will permit, the Esmarch rubber bandage is tightly applied from the hand to the shoulder joint, following which the rubber cord is adjusted as just described.

Amputation by the deltoid flap method is executed as follows; after the surgical toilet has been completed and the patient anæsthetized, the rubber cord is passed through the axilla and over the outer part of the shoulder including the outer end of the clavicle, making the second loop and drawing it tightly before tying. With the shoulder extending over the edge of the table, a U-shaped musculo-cutaneous flap is fashioned including most of the deltoid muscle by commencing the incision on a

level with and about one inch in front of the coracoid process, extending down the front of the arm to a point a little above the insertion of the deltoid muscle, then by a circular sweep it is carried across the outer aspect of the arm and upward to a point posterior to the acromion process and on a line with the spine
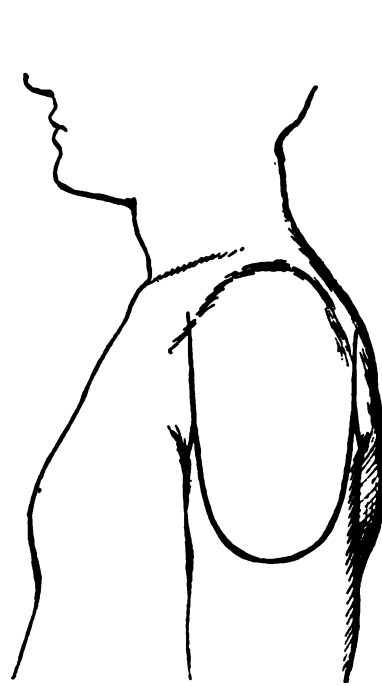
Fig. 325.—Line of incision for lateral deltoid flap amputation at the shoulder joint. (*McGrath.*)

Fig. 326.—Same as Fig. 325. View from the back.

of the scapula. In making the incision the knife is held in such a manner that the edges of the flap will be cut on a bevel, the skin edges extending over or beyond that of the inner muscular edge. This musculo-cutaneous flap is next dissected up from the humerus and retracted over the shoulder, exposing the capsular ligament which is opened by incision from before backward, keeping the edge of the knife pressed against the surface of the head of the

humerus, severing the long tendon of the biceps with a sweep of the knife. By rotating the humerus outward and inward, the ligaments and muscles that hold the joint in position are brought into view and cut, allowing the separation of the head of the humerus from the glenoid cavity. As the head of the humerus is forced outward the long amputating knife is introduced behind it and made to cut downward to a point about two inches below the axilla, keeping the knife's edge cautiously against the inner surface of the bone; from this point the knife is turned away from the bone and made to cut its way to the skin surface dividing the brachial vessels at the same time. To prevent any great loss of blood it may be well for the assistant to grasp the inner flap before it is severed, and compress the vessels between the thumb and fingers, holding the fleshy mass until the surgeon can pick up the spurting arteries and veins and tie them.

After the amputation has progressed thus far the wound should be examined for dangling shreds of muscle and tendons, which if found should be removed, as well as projecting ends of nerves; the flaps adjusted and united with catgut sutures placed half an inch or more apart, after having placed a piece of sterile tubing or gauze between the edges of the flaps for drainage. The external parts are then washed with some antiseptic solution, and dressed with sterile gauze and secured with several turns of a roller bandage.

Amputation of the Toes.

To lose a part, or all, of one or more of the toes, cripples to a greater or less extent the act of locomotion. Morbid states of the toe nails, crushing injuries, and deformities of the toes occasion the demand for amputation, which is executed as follows; As the amputation is usually effected at the articulation, a dorsal incision is made transversely from left to right a little in front of the joint, extending well down on each side of the toe, dividing the skin and fascia to the bone. This short cutaneous flap is dissected back to the joint, the lateral ligaments severed, the articular end of the phalanx forced outward, and with a narrow bladed knife introduced behind it and made to cut forward a half an inch or more, the plantar flap is formed. The bleeding vessels are picked up and twisted or tied, and the edges of the

flaps placed in apposition and united with three or four catgut sutures. The stump should be dusted with some potent antiseptic powder and dressed with sterile gauze.
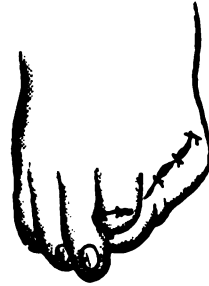
Fig. 327.—Amputation of the toes, at the first and metatarso-phalangeal articulations.

Owing to the important part that the great toe displays in the act of walking, it is desirable to always preserve as much of the member as possible, hence it will be better to amputate in continuity than to sacrifice the toe at the metatarso-phalangeal articulation, when feasible. As cicatrices following operations involving the skin are generally sensitive, the incisions should be so arranged when operating upon the foot, that no scar tissue will
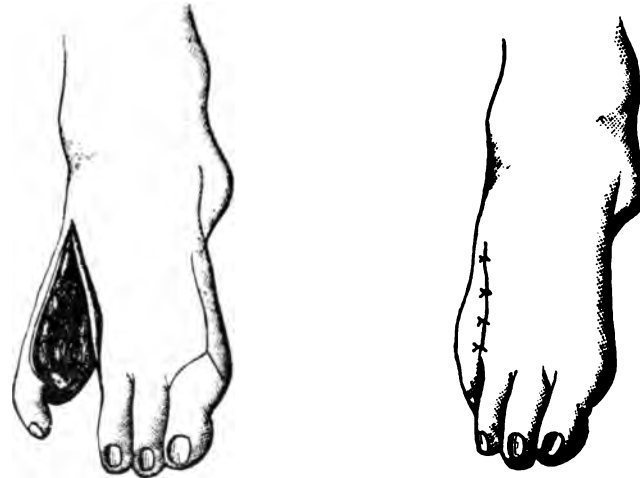
Fig. 328.—Amputation of the second toe with the metatarsal bone, with line of incision for the removal of the great toe.

appear on the plantar surface. Amputation of the
through the proximal phalanx by the **racket** method
give excellent results, and is executed as follows: :
in cutting the handle of the racket, is commence
on the metatarsal bone on the dorsal surface a
in a straight line to near the end of the phalanx,
across the bone at the lower extremity of thi
and is made, then dividing the soft parts to the
The soft parts are now dissected away from
the phalanx to a point just back of the head
seizing it with the strong forceps and the disengaged
The bleeding vessels are now picked up and e
then the edges of the flaps trimmed and s
with sutures and the wound then i
dressed.

Amputation through the Tarso-metatarsal Artic

cut at the tarso-metatarsal
by several methods, each of which is nar
to originate the special plan of an ear
a certain result is obtained by a us of an
the great time as used in amp of a an foot
this method of exciting of the pro
has been generally remarked as Lisfranc's m

is run on the leg and just above it a rubber cord is adjusted by
two turns around the leg and tied, when the rubber bandage is
removed. With the foot extending over the end of the table
and the integument retracted by the assistant, a curved incision
is made across the dorsum of the foot, commencing at the project-
ing base of the first metatarsal bone and terminating at the base of
the fifth metatarsal bone, the convexity extending toward the
toes. Each extremity of.the incision should end a little below
the joint, that later the ends of the bones will not be exposed by
the retraction of the cutaneous flap.

The plantar flap is now formed by commencing it at the inner
extremity of the dorsal incision, passing forward along the inner
border of the foot to a point just back of the toes, then crossing
the sole by a slightly curved line to the outer border of the
foot and then back to the outer end of the dorsal incision. The
dorsal flap is next dissected back on a line with the tarso-metatar-
sal articulation, the muscular and tendonous structures about
which are divided while the foot is forcibly depressed, the joints
of the several metatarsal bones are then opened up, the surgeon
executing the work from both sides of the foot. After the ar-
ticulations have been disengaged the long amputating knife is
introduced behind the ends and made to cut forward, thus form-
ing the plantar flap along the lines made by the second incision.
In forming this plantar flap the knife must be kept close to the
bones of the foot.

After removing the amputated part of the foot the traumatic
surfaces are examined for protruding nerves and tendons, which
if found should be cut away, all bleeding vessels picked up and
tied, when the flaps can be placed in position and united with
numerous catgut sutures. The stump is cleaned of all soilings
and dressed in the usual way.

Amputation through the Medio-Tarsal Joint·

The medio-tarsal amputation of the foot, first executed and
described by Chopart, is done by disarticulating the scaphoid and
cuboid bones in front, the astragalus and calcaneum behind. The
dorsal incision commences about the middle of the outer border
of the foot about one inch behind the base of the fifth metatarsal
bone and is brought across the arch by a curved sweep with the

appear on the plantar surface. Amputation of the great toe through the proximal phalanx by the **racket** method of **incision** give excellent results, and is executed as follows: the incision representing the handle of the racket, is commenced over the head of the metatarsal bone on the dorsal surface and extends down the median line to near the end of the phalanx, dividing all the tissues of the bone; at the lower extremity of this incision a circular cut is made, also dividing the soft parts to the bone. The musculo-cutaneous flaps are now dissected away from the distal end of the phalanx to a point just back of the head where it is severed with bone cutting forceps and the disengaged portion removed. All bleeding vessels are now picked up and either twisted or ligated, the edges of the flaps trimmed and united with three or four catgut ligatures and the wound then dressed with sterile gauze.

Amputation through the Tarso-metatarsal Articulation.

Amputation of the foot at the tarso-metatarsal articulation is executed by several methods, each of which is named after the surgeon who originated the special plan of procedure. As Lisfranc's method of operation is favored by most surgeons, and when properly done gives such uniformly good results the technique of this method of procedure only will be given. After the foot has been aseptically prepared, an Esmarch's rubber bandage

Fig. 329.—Amputation of the foot. (*Lisfranc's* operation.)

is run on the leg and just above it a rubber cord is adjusted by
two turns around the leg and tied, when the rubber bandage is
removed. With the foot extending over the end of the table
and the integument retracted by the assistant, a curved incision
is made across the dorsum of the foot, commencing at the project-
ing base of the first metatarsal bone and terminating at the base of
the fifth metatarsal bone, the convexity extending toward the
toes. Each extremity of the incision should end a little below
the joint, that later the ends of the bones will not be exposed by
the retraction of the cutaneous flap.

The plantar flap is now formed by commencing it at the inner
extremity of the dorsal incision, passing forward along the inner
border of the foot to a point just back of the toes, then crossing
the sole by a slightly curved line to the outer border of the
foot and then back to the outer end of the dorsal incision. The
dorsal flap is next dissected back on a line with the tarso-metatar-
sal articulation, the muscular and tendonous structures about
which are divided while the foot is forcibly depressed, the joints
of the several metatarsal bones are then opened up, the surgeon
executing the work from both sides of the foot. After the ar-
ticulations have been disengaged the long amputating knife is
introduced behind the ends and made to cut forward, thus form-
ing the plantar flap along the lines made by the second incision.
In forming this plantar flap the knife must be kept close to the
bones of the foot.

After removing the amputated part of the foot the traumatic
surfaces are examined for protruding nerves and tendons, which
if found should be cut away, all bleeding vessels picked up and
tied, when the flaps can be placed in position and united with
numerous catgut sutures. The stump is cleaned of all soilings
and dressed in the usual way.

Amputation through the Medio-Tarsal Joint·

The medio-tarsal amputation of the foot, first executed and
described by Chopart, is done by disarticulating the scaphoid and
cuboid bones in front, the astragalus and calcaneum behind. The
dorsal incision commences about the middle of the outer border
of the foot about one inch behind the base of the fifth metatarsal
bone and is brought across the arch by a curved sweep with the

convexity extending toward the toes, and ending on the inner
border of the foot in front of the tubercle of the scaphoid bone.
The tissues are all divided down to the bones when making the
incision. The plantar flap is next mapped out by making an in-
cision from the outer ending of the dorsal cut forward along the
border to a point on a line just back of the metatarso-phalangeal
joint of the fifth toe, then across the sole of the foot to the inner
border and back to the end of the inner extremity of the first or
dorsal incision. The dorsal flap is now dissected up to the articu-
lations previously mentioned which are opened by severing the
ligamentous structures, at the same time depressing the foot
with the left hand to aid in the separation of the articular sur-
faces, after which the plantar flap is formed by cutting from with-
in outward, following the lines of incision made when marking
out the plantar flap. The dorsalis pedis artery located near the
inner side of the foot is picked up and tied, likewise the several
branches of the plantar arch found in the plantar or posterior
flap. It will be observed that the dorsal flap will be very short
compared with the plantar flap, and will be composed principally
of skin, fat, and fascia; while the posterior flap should compose
all of the tissues of the sole of the foot. The action of the tendon
Achilles sometimes draws the distal end of the stump backwards
to a degree that causes more or less discomfort following the
healing process, to obviate which it will be well to sever the
tendon at the time of the amputation.

After the traumatic surfaces are freed from all redundant
tissue the flaps are united by numerous interrupted catgut su-
tures and the stump dressed with sterile gauze and bandaged.
The cause requiring the amputation and the healthy state of the
lower limb will determine the necessity of making provision
for drainage at the time of the operation.

Amputation at the Ankle Joint.

Amputation at the ankle joint is required in crushing in-
juries of the foot, and in extensive necrotic states of the tarsal
bones. The entire tissues of the heel are made to form the cush-
ion flap of the stump in most cases, and if the operative pro-
cedures are successfully done there will be little shortening of the
limb, hence only a slight limp in locomotion. There are sev-

eral methods of amputation in favor with operators, each bearing the name of the surgeon who originated the special technique. The Syme and Pirogoff methods are generally followed and will be briefly mentioned here.

After the leg and foot have been aseptically prepared, an Esmarch rubber bandage is run onto a point above the calf of the leg; just above it a rubber tourniquet is passed twice around the leg and drawn tightly and tied. The rubber bandage is then withdrawn. With the leg extending from the edge of the table, an incision is commenced at the middle of the external malleolus, in Syme's operation, and passes downward and across the sole of the foot and up on the inner side to the internal malleolus, the incision dividing all of the tissues to the bone. The anterior flap is formed by confmencing the incision at the inner termination of the first incision, and passing around in front of the ankle joint, it ends at the point of commencement of the first incision. In its course the second incision divides skin, fat, and fascia down to the bone; then with a scalpel the extensor tendons are severed, also the ligaments about the joint including the anterior, following which the foot is grasped and forcibly flexed until the lateral ligaments are exposed when they should be cut, allowing the wound to gap sufficiently to bring into view the tendons of the peronei on the outer side and of the tibialis posticus on the inner side, which should also be divided. The next step in the operative procedure is the enucleation of the os calcis from the posterior flap, the dissection being done with a scalpel, keeping the edge of the knife against the bone to prevent button-holing the flap and injuring the important nerves and vessels resting adjacent to the bone.

The dissection of the os calcis completed and the foot removed the heel flap is turned backward and upward, being dissected free from the lower end of both the fibula and tibia to the extent of about one inch and a half. The lower ends of both bones are then sawed off, removing a slice of each articular surface. If the ends of divided tendons are found extending too far from flap surfaces, they should be cut short, and the nerve trunks should be severed high enough not to become involved in the healing process. The anterior tibial artery, and the internal and external plantar arteries, are next picked up and ligated, when the heel

flap is placed in position and united with interrupted catgut sutures. If drainage is provided for, a small rubber drainage tube is placed in the wound, and made to extend from its margin a half-inch or so, before closing; or, an incision may be made through the posterior flap, and kept open for a few days, by inserting a gauze drain. Cleanse the stump of all discharges, and dress it with sterile gauze and bandage.
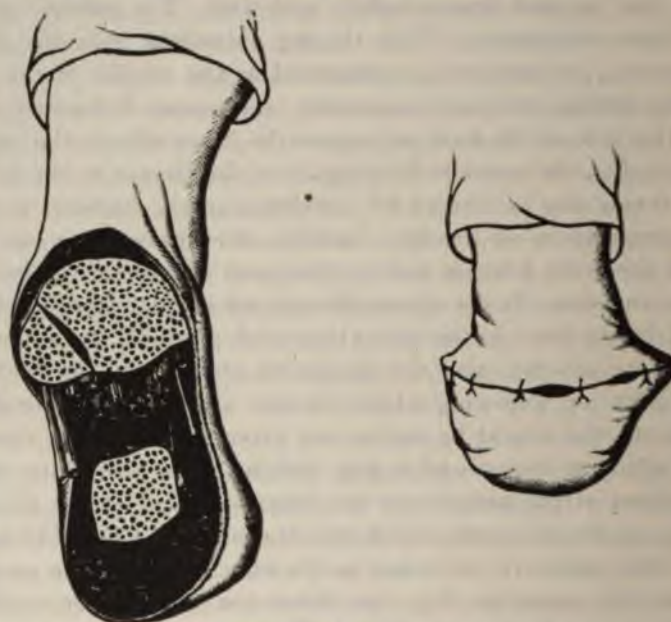
Fig. 330.—*Pirogoff's* amputation of the foot.

In Pirogoff's method of amputation the first and second incisions are made the same as in the Syme's operation. The former operation differs from the latter in the formation of the plantar, or heel flap, by way of merely dissecting the soft structures back from the os calcis and astragalus to a point on a line with the posterior border of the articular surface of the astragalus. At this point the os calcis is severed with the saw at right angles with the bone, and the flap turned upward and closely dissected away from the ends of the tibia and fibula, which are then sawed off about a half-inch or more above their articular surfaces. With the protruding tendons and nerves cut

away, and the vessels picked up and tied, the plantar flap is brought forward into position with the cut surface of the retained section of the os calcis resting up against the sawn surface of the tibia. Held in this position, the edges of the wound are united with numerous catgut sutures. Provision for drainage is made through an incision in the posterior flap, in its outer dependent portion. It is considered advisable by surgeons of extended experience to divide the tendo Achillis subcutaneously about two inches and a half above its attachment to the os calcis, to prevent undue tension upon the flap by its subsequent contraction. While the modifications of the Syme's and Pirogoff's operations have some points of interest to commend them, under certain conditions, the general results obtained from following their methods of operative technique are no better than those observed in the original methods.

Amputation of the Leg

Amputation of the leg may be done at any point between the ankle and the tuberosity of the tibia. For the sake of surgical convenience the leg is divided into the lower, middle, and upper thirds, and when possible the amputation is executed in one of these sections.

The operative work is done by the circular or lateral flap method, or some one of the modifications of these methods. However, preference is given to the circular operation when conditions are favorable for its execution. The flap method is usually chosen when the leg has been badly mangled, one surface suffering a greater loss of integument and adjacent tissue than does the other. Under such conditions a short flap is formed on the mangled side, and a long flap on the opposite surface to compensate for the loss, and to make it possible to save as much of the limb as the morbid state will permit of, and at the same time have sound tissue sufficient to cover the bones. From whatever portion of the leg the principal flap is taken, provision should be made not to have the suture line rest directly over the end of the bones, as the resulting cicatrix would most likely prove very sensitive, and painful to any pressure that the end of the stump might be subjected to.

Under favorable conditions an amputation through the lower third, by the hood-flap method, is executed as follows: The leg is put in an aseptic condition, and the circulation restricted by running on an Esmarch bandage to a point above the calf of the leg, immediately above which a rubber tourniquet is looped twice around the leg and tied, when the bandage is removed. With the patient under an anæsthetic, and the leg extending over the edge of the operating table, the point at which the bones are to be divided is noted, if necessary, by pencil markings. The next step is the tracing of the skin flaps with a pencil, which is commenced in front of the limb, an inch and a half to two inches below the point at which the bones are to be divided, and extending downward and backward in a curved line on either side of the leg, terminating posteriorly in the middle of the leg. From this point a vertical line is run upward to a level with the point at which the bones are to be divided. With a large scalpel these tracings are followed by incisions, which extend through skin and fat down to the superficial fascia. Each lateral flap, which equals in length two-thirds of the diameter of the limb at the point at which the leg is amputated, is now dissected up and reflected back upon the leg, executing the work with circular sweeps of the amputating knife, the edge of which is kept directed toward the fascia to prevent injuring the vessels and nerves that are to furnish nourishment to the flaps.

The flaps are reflected back to a point on a level at which the bones are to be divided, and held in this position by an assistant while the muscular structure is divided by a circular sweep of the knife to the bones, which are now sawed through after the soft tissue between the bones has been cut with a catlin or bistoury.

The flaps and muscular tissues are usually held out of the way of the saw by the three-tailed cloth retractor, in the hands of an assistant, and the saw first applied to the tibia and drawn toward the operator to form a groove, in which the sweeps of the saw afterward work freely without wabbling. After the tibia is partly sawn through, the saw is made to engage the fibula, and both bones are then severed together. While this work is in progress the leg must be steadied by the assistant,

and care taken by the operator that the last sweep or two of the saw does not splinter the surface of the bones.

In amputations through the large bones of the limbs it is good practice to round off the edges of the ends of the severed bones with bone-cutting forceps, to lessen the liability to pressure injury to the inner surface of the flaps during the process of repair.

After the severed portion of the leg and foot have been removed, the protruding tendons and nerves are cut short, and all ragged tissue removed from the flaps, and the severed blood-vessels picked up and ligated, before the tourniquet is loosened. It is not uncommon to note a little spurt of blood from some small arterial twig immediately following the removal of the rubber tourniquet; but the application of a small hemostat will immediately check the bleeding, especially if tortion is made upon the vessel. After inspecting the stump, if everything is found surgically in form, the flaps are adjusted and joined with interrupted catgut sutures, first having made provision for drainage through the posterior suture line. The stump is cleaned, and dressed with gauze pads, and properly bandaged.

The technique followed in amputation of the leg in the lower third by the circular method, is as follows: The preparation for the operative work will be done along the same lines as previously mentioned. A circular incision is made, to divide the integument and fat, down to the fascia surrounding the muscles and tendons. The length of the circular flap or cuff should equal in length a little more than one-fourth of the circumference of the limb at the point at which the bones are to be severed. This cutaneous sleeve is dissected up and turned back to a point on a level at which the bones are to be sawn through. At this point the soft parts are all divided, by a circular sweep of the knife, to the bones. The flap and soft tissues are held back out of the way of the saw, and the bones severed as directed in the flap method. After making provision for drainage, the edges of the cutaneous sleeve are approximated, and united with interrupted catgut sutures, when the stump should be dressed in the usual way.

Amputation of the leg through the middle third can be executed along the lines advised for amputation in the lower third.

The muscles of the calf of the leg present some difficulty, in some cases, to a nice adjustment of the cutaneous flaps; but not such as to render the coaptation embarrassing.

If the calf muscles are not too large, the single posterior flap method can be adopted with excellent results, and is done as follows: The circumference of the leg should be obtained at the point of amputation; then a transverse incision is made across the front of the leg, commencing at the posterior border of the fibula, and ending at the posterior border of the tibia, dividing the skin and subcutaneous tissue at a point about one and a half inches below the level at which the bones are to be sawn through. Then extend the incision down to the bones, and dissect the entire flap upward to the point at which the bones are to be sawn through. After dividing the interosseous membrane, the posterior flap is made by transfixion, and should equal in length the diameter of the leg at the point of amputation. After the bones have been severed, and the amputated part removed, the flaps are freed from all ragged tissue, the arteries picked up and tied, the flaps are then adjusted and fixed with interrupted catgut sutures, provision for drainage provided for, after which the stump is dressed in the usual way.

Another method that gives uniform good results in amputation through the middle third of the leg, is executed as follows: An anterior flap is formed by commencing the incision at the posterior edge of the tibia, on the inner side, about one inch and a half below the point at which the bones are to be severed, passing down the side of the leg and across in front, thence upward on the outer side to a point on the fibula opposite that at which the incision was commenced; dividing skin and fat to the fascia enveloping the muscles, forming a flap which in length should equal the diameter of the leg at the point at which the bones are to be sawn through. The cutaneous flap is then dissected up a half an inch or more and the underlying muscular structures are divided to the bones and the entire flap dissected free from the bones and interosseous membrane by blunt dissection, that important vessels be not injured, up to the level at which the bones are to be sawn through. The amputating knife is then introduced behind the bones, and made to cut transversely outward on a line with the beginning of the first in-

cision, thus forming the posterior flap. After the interosseous tissue is cut, the soft parts are retracted with a three-tailed cloth retractor, the bones sawn through, the arteries ligated, and the flaps adjusted and fixed with catgut sutures, and the stump dressed in the usual way.

Amputation of the leg through the upper third involves more important vessels and muscular structures than is encountered in the lower or middle thirds of the limb. The point at which the bones are to be severed should extend as far below the tuberosity of the.tibia, which makes the attachment of the ligamentum patella, as the traumatic condition or diseased state will permit of. It is also very necessary to preserve the head of the fibula intact that the function of the knee joint will not be interfered with.

The operative work is done by various flap methods, none of which have anything to commend them over the circular method when conditions are favorable for its execution. The successive steps in the operative work by the circular flap method are briefly given as follows; with the parts involved aseptically prepared and the patient under the anæsthetic effect of chloroform, an Esmarch bandage is applied to the limb to a point four inches or more above the knee joint, where it is supplemented by a rubber cord drawn tightly and fastened. The circumference of the leg is obtained at the point of selection, and at a line distal to this point equal to nearly one half the circumference of the leg, a circular incision is made around the limb dividing the skin and fat down to the fascia. The cutaneous cuff or sleeve is dissected up and turned back upon the future stump to nearly the point at which the bones are to be sawn through; at this junction the soft parts are divided to the bones, including the interosseous tissue; the cutaneous flap and soft parts are now to be forcibly retracted back out of the way of the saw and the bones severed high up, care being taken not to splinter the under surfaces of the bones by the last few sweeps of the saw. The fibula is usually divided first and a very little higher up than the point at which the tibia is sawn through. After severing the tibia the sharp anterior edge should be well beveled off that later it does not cause a pressure slough of that part of the flap that rests upon it. It is good practice to incise the

periosteum an inch or more below the point at which the tibia is to be divided and forming posterior and anterior flaps which should be dissected up to the saw line and later brought over the end of the bone and united with catgut sutures. The cutaneous flap is now turned back into position (first inspecting the divided arterial trunks that they be properly tied), and the edges united with interrupted catgut sutures, drainage provided for by placing in the wound a perforated rubber tubing which should extend from each extremity of the suture line a half inch, and should be left in place for one or two days and then removed. The stump is kept clean with potent antiseptic solutions and dressed with sterile gauze.

If the existing morbid state justifies amputation by the flap method, the modified method of Bell, if properly done gives as good results as any one of the others in vogue. It is executed by forming two semi-lunar flaps of equal length, about three inches long, one antero-external and the other postero-internal including the skin and subcutaneous fat. The inner extremities of the incisions forming these flaps meet at opposite points of the leg on a line fully two inches below the tuberosity of the tibia. These flaps are then dissected up from the deep fascia to a point about one inch above the lateral meeting of the flap incisions, this will include the integument and fat above the linear flap incisions and extending around the circumference of the leg. The cutaneous flaps are then retracted and the muscles on the anterior part of the leg cut close to the flap, and the posterior muscles a little above the middle of their exposed surface. With the soft structures well retracted the bones are sawn through high up, the edges of the tibia well beveled off, especially in front, the divided ends of the arteries picked up and tied, the flaps adjusted and united in the usual manner. The stump is cleaned of all discharges and dressed with sterile gauze pads and bandages. Provision for drainage is made by placing in the wound a section of sterile perforated rubber tubing.

Amputation at the Knee Joint.

Amputation or exarticulation of the leg at the knee joint by the hooded flap method as advised by Smith, if properly executed gives excellent results in the large majority of cases.

A point well worth remembering in connection with this amputation is the large end of the femur, to cover which, ample flaps must be provided. It may be well to mark out the two lateral flaps before making the incisions. The outline should start in front of the leg about one inch distal from the tubercle of the tibia, and pass downward and backward in a curved line on either side of the leg to a point in the middle line posteriorly and rather low down; from this point a median line is traced upward well into the popliteal space, or on a level with the knee-joint. The incision that follows these tracings should divide the skin and subcutaneous fat; the flaps are dissected up and away from the deep fascia by repeated sweeps of the long amputating knife, its edge always directed towards the fascia so as not to button-hole the flaps. After the flaps have been reflected up on a level with the joint, the muscular structures are severed with the knife commencing with the ligamentum patella at its lower part. The leg is then flexed upon the thigh and after the lateral and other retaining ligaments are severed the semilunar fibro-cartilages are separated from the upper surface of the tibia and left intact with the stump. With the joint disarticulated the long amputating knife is introduced behind the upper end of the tibia and made to sever the posterior structures on a level with the joint by cutting straight backward. The amputated part is then removed and the flaps freed from any loose pieces of tissue, the protruding tendons and nerves cut short, the popliteal artery and its accompanying vein are secured and ligated, and after providing for drainage through the posterior suture line, the flaps are adjusted and joined by interrupted catgut sutures.

Not much blood will be lost during the operative work if a rubber tourniquet is tightly adjusted around the thigh several inches above the joint previous to commencing the operation. If due caution is taken to prevent infection during the operative procedures the drainage tube can be removed the second or third day, and the wound should be healed in two weeks.

Amputation through the condyles is a fe⁣   ·* ⁣
and the results in the large majority of ca⁣
It is performed by the oval flap method and
the incision at the outer side of the leg

the joint passing slightly downward and across the front of the leg about three inches below the patella and then backward and upward and then across the posterior part of the leg about one half inch below the articulation and terminating at the point of commencement. The incision divides the skin and subcutaneous fat which is dissected up and reflected back to a point immediately above the patella and the joint opened by dividing the muscular and tendonous structures in front not including the patella in the flap. After disarticulation the posterior soft parts are severed from within outward with the long amputating knife, and the popliteal artery and vein picked up and tied. The condyles are then sawed through above the upper edge of the articular cartilage and the edges of the sawn surface of the femur cut away with bone forceps. The flaps are adjusted and united with interrupted catgut after making provision for drainage, and the stump dressed in the usual manner.

There are other methods of amputation of the leg at the knee joint, some of which are modifications of those given in detail, but as they give no better results time and space will not be given here to their technique.

Amputation of the Thigh.

The thigh is surgically divided into the lower, middle, and upper thirds, and whatever point is selected for amputation, ample tissue will be found to accommodate any one of the various methods in favor with operators. The modified circular method has many advocates as has the anterior and posterior flap method; the latter having several modifications to meet existing morbid states in different portions of the thigh.

The modified circular method is executed by three successive steps, and is especially adapted to the lower and middle thirds of the thigh. After the surface of the thigh has been surgically prepared, an Esmarch bandage is tightly run on the leg and thigh up to a point near the body, supplemented by a rubber cord twice encircling the thigh and drawn tightly and fastened. The bandage is then removed and the patient so placed that the thigh should extend over the end of the table. With the patient under an anæsthetic and the limb supported or steadied by assistants above and below, a circular incision is swept around the thigh at

a distance from the point at which the bone is to be sawn through, equal to one fourth of the circumference of the limb. The incision divides skin and fat down to the deep fascia. The cutaneous flap is then dissected up and reflected back upon the thigh to within an inch or so of the point at which the bones are to be divided. The dissection is done with a long amputating knife held at right angles with the long diameter of the thigh and directed against the fascia that the flap is not cut into. The dissection is facilitated on the posterior part of the leg by having an assistant hold the limb in an elevated position. At the base of the cutaneous sleeve or flap the muscular structures are all divided to the bone by a circular sweep of the amputating knife, which is then forcibly separated from the bone by blunt dissection upward to the extent of an inch, or to the point at which the femur is to be divided. The soft structure including the flap is then retracted, exposing the bone which should be encircled with the amputating knife, completely separating the periosteum at which point the bone is sawn through, care being taken not to splinter or otherwise break the surface of the femur with the last sweep of the saw. The edges of the femur should be rounded off with bone cutting forceps to prevent irritation of the flap tissue that later will rest against it.

The nerve trunks are cut short that they may not become involved in the healing process, the blood vessels picked up and ligated, after which the rubber tourniquet may be removed. If other bleeding points present themselves they should be clamped at once and if necessary twisted or ligated. Means are next provided for drainage and then the cutaneous cuff is turned back into position, its edges are brought together transversely and united with interrupted catgut sutures. Next free the stump of all soilings and dress with loose fluffy pieces of sterile gauze and bandage.

The double flap method of amputation of the thigh through the lower and middle thirds usually gives good results and is easy of execution. It is performed by transfixion and each flap includes all of the muscular tissue to the bone. After selecting the point at which the femur is to be divided, the soft structures are to be grasped with the left hand of the operator and with the long amputating knife in the right it is made to enter the

middle of the thigh nearest himself and forced through to the opposite side at a point directly opposite to the point of entrance. In making this flap the knife is kept in close contact with the anterior surface of the femur and after passing which the handle of the knife should be raised slightly to cause the point to dip a little. With the tissues transfixed the knife is made to cut its way downward and outward, forming the anterior flap. The knife is now re-entered at the original point of entrance and forced through the thigh behind the bone and emerging at the

Fig. 331.—Flap amputation of the thigh through the lower third.

inner extremity of the first incision, is made to cut, by a sawing motion, downwards and backwards toward the skin surface thus forming the posterior flap which should be a little longer than the anterior flap. The anterior flap should correspond in length to about one half of the diameter of the limb at the point of amputation.

With the soft parts divided the flaps are held out of the way of the saw by a slit cloth retractor and the bone sawn through at the highest point of the incision. The amputated part removed and the vessels ligated, the flaps are brought into position and

united and dressed in the usual way. If careful attention is given to the antiseptic technique during the operative procedure provision for drainage will hardly be necessary.

Amputation or Exarticulation of the Thigh at the Hip-Joint

Removal of the lower limb at the hip-joint is the most formidable operation of any of the amputations. Causes requiring this operation may be enumerated as extensive traumatic injuries, caries, necrosis, gangrene, osteo-sarcoma and other morbid states that may cause a loss of the muscular and osseous structures of the thigh, yet leave a healthy hip-joint and its immediate surroundings.

The Wyeth method is quite generally practiced in executing this amputation and gives excellent results if conditions are

Fig. 332.—*Wyeth's* amputation at the hip joint. Pins are placed to prevent slipping of the rubber tubing (tourniquet). Upon the outer side of the thigh the incision reaches to the bone. A circular skin flap has been turned back and the muscles and blood vessels divided down to the bone. Clamps are seen fixed to the femoral artery and vein. (*McGrath.*)

favorable to its execution. With the parts involved rendered aseptic and the patient under an anæsthetic and lying upon the back with the thigh extending over the end of the operating table, an Esmarch bandage is applied tightly to the limb up to a point on a level with the joint, just above which a stout rubber cord is adjusted by encircling the hip twice and tied. This cord is held in place by two long sharp pointed pins thrust through the skin and superficial fascia, one on the inner side of the thigh and the other on the outer side of the hip just below the anterior superior spine of the ilium below the cord and through at least five inches of tissue to insure the retention of the rubber tourniquet in position. Note the positions of the pins in the accompanying cut. Care should be taken not to injure the femoral vessels when introducing the pin on the inner side of the thigh. A hard compress made to rest over the femoral artery and vein and under the rubber tourniquet serves as an excellent medium to restrain hemorrhage during the operative work.

While executing the operative work the surgeon stands on the outer side of the limb which extends over the end of the table and steadied by an assistant. The operator then makes a circular incision around the thigh about five inches below a point on a level with the perineum, with a long amputating knife which is passed up between the limbs from below to the anterior surface of the thigh where the incision is commenced at the point mapped out; from here it passes down the inner side of the thigh, through, under and up on the outer side and terminating at the original point of commencement. This incision divides the skin and fat down to the deep fascia. The second incision is then commenced at a point just above the great trochanter on the outer side of the thigh and is carried downward to the intersection of the circular incision, dividing all the soft structures to the bone. The integumentary flap including the subcutaneous tissue is next dissected up from the deep fascia to the extent of three inches or more and reflected back upon the upper part of the thigh. At the base of this flap the entire muscular structure, including the vessels and nerves, is divided to the bone. The vessels, which include the femoral artery and vein in front, and the profunda femoris and its accompanying vein which lies

deeper and nearer the bone are next secured and ligated with a silk ligature, or No. 3 catgut, and the ends cut short.

The femur is next dissected free from the surrounding muscular tissues and disarticulated by severing the capsular and other ligaments that hold the joint together. In forcing the head of the femur out of the socket the ligamentum teres should be cut as soon as exposed. In separating the muscular structure from the bone, the edge of the knife must be kept close to the femur, not to wound unnecessarily the soft structures. The rub-
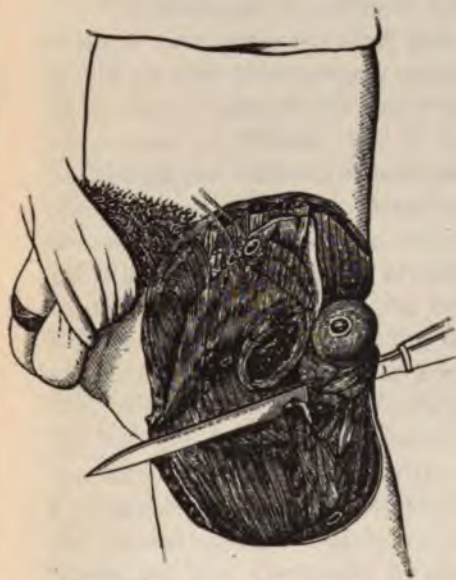
Fig. 333.—Amputation at the hip joint by the flap method.

Fig. 334.—Flaps closed with fifteen-day catgut, with drainage tube in place.

ber tourniquet which should be left in place up to this time is now removed and any spurting vessels picked up and twisted or ligated, that may be disclosed. The flaps are inspected for any loose dangling tissue which should be trimmed away if found, a drainage tube placed in the gaping wound well up into the cotyloid cavity, the flaps adjusted and united with catgut and silk-wormgut sutures and the stump dressed with loose gauze pads and lightly bandaged. Remove drainage tube on fourth day if the wound does well. As a preliminary precaution

against a great loss of blood the femoral artery and vein may be cut down upon and tied within about two inches of Poupart's ligament, or at least above the origin of the deep profunda femoris branch.

Of the several other methods of amputation of the leg at the hip joint nothing can be claimed in results that would commend them in place of Wyeth's operation, a brief description of which has been given above.

PART TWENTY-TWO

Venereal Diseases

GONORRHEA

The discharge of purulent infectious matter from the genital mucous membrane is called gonorrhea. Clap and specific urethritis are also synonymous terms. The disease is characterized by an active inflammatory process, due to a specific germ called gonococcus of Neisser, and is imparted by sexual intercourse, or through the medium of instruments, syringes, or other objects contaminated with the contagious fluid coming in contact with the urethral meatus. The inflammatory lesion may exist and affect only a portion of the urethral canal, and again it may be so far-reaching as to complicate not only the entire mucous surface of the urethra, but of the bladder as well. The disease is divided into three stages, the acute, subacute, and chronic; however, there is but little difference in the local manifestations of the last two forms of the malady. The disease is known to be specific; a nonspecific urethritis often results from infection by a pyogenic germ, the staphylococcus, and may be developed by the genital mucous membrane coming in contact with the retained and foul discharges of ulcerations, leucorrhœa and other acrid inflammatory secretions of a like character.

The first manifestations of the disease are stinging and itching sensations in the meatus on urinating five or six days after a suspicious intercourse; about this time the lips of the meatus become somewhat everted, red, and swollen, and there is observed a slight moisture, which, within the next day or two, becomes more profuse and of an opaque character. From this time on, for the next ten days to two weeks, the inflammatory symptoms increase in severity, and there are frequent calls to void the urine, which is attended with acute pain and scalding. The discharge, which was thin and opaque at first, has now

changed in character, and becomes more pus-like in appearance.
If the inflammatory action be severe, the discharge is quite likely
to be tinged with blood, and the lymphatic glands about the
groin become red, swollen and tender; painful erections and
chordee are frequently met with at this stage of the disease,
much to the discomfort of the patient; there is also present a
feeling of weight and dragging in the testicles, with an aching
across the small of the back. The urethra is swollen and keenly
sensitive to the touch, and the urine is often voided with diffi-
culty. The inflammatory action may be so great, and congestion
of the entire organ so pronounced, as to give rise to edema of
the prepuce, with phimosis; or paraphimosis, where the foreskin
becomes retracted behind the glans penis with infiltration of the
tissue with serum.

Gonorrhea in the female is less violent and distressing than
in the male, and generally gives rise to a sense of pelvic fullness
and pain, with a dragging feeling about the loins. The urethra is
seldom infected, but the vaginal discharge becomes muco-puru-
lent and abundant. There is more or less turgescence of the
genitals, with itching and smarting when voiding urine. The
duration of the disease is about four weeks, if judiciously treated.
The extension of gonorrheal infection to the pelvic organs is
responsible for many of the serious inflammatory diseases of
women; foremost of these mentioned, metritis, endo-metritis,
pelvic cellulitis, peritonitis, ovaritis, and tubal complications.
The vaginitis resulting in a muco-purulent discharge, frequently
met with in little girls, that often leads to suspicion of specific
infection, usually results from the deposit of dirt, vermin and
general uncleanliness.

Treatment. Treatment of the first stage consists in open-
ing the bowels with broken doses of epsom salts, after which
give ten grains of the same remedy every hour, dissolved in a half
glassful of water; this will act as a diuretic and will relieve the
stinging and burning to some extent. The penis should be im-
mersed in quite warm water, in which a little borax has been
dissolved, several times during the day, after which several
syringefuls should be injected of the same mixture. To insure a
speedy cure, the patient should be enjoined to keep off his feet

as much as possible, and eschew stimulants of all kinds, both in food and drink. The following mixture will be found useful here to relieve the local irritation and burning:

R.
Spec. Tr. Gelsemium .... 3 j
Spec. Tr. Cannabis Indica .... 3 ss
Spec. Tr. Aconite .... gtts. x
Peppermint Water, q. s. ....fl. 3 vi
M. Sig.—A teaspoonful every two hours, alternated with the sulph. of magnesia.

This line of treatment should be followed judiciously for about ten days, when the inflammatory symptoms will have well subsided. The treatment must now consist of:

R.
Spec. Tr. Staphysagria .... 3 j
Spec. Tr. Belladonna .... gtts. x
Peppermint Water, q. s. ....fl. 3 iv
M. Sig.—A teaspoonful every two hours.

An occasional dose of five drops of the spec. tr. of lupulin in water will be beneficial at this time, as will pulsatilla and macrotys, singly or in combination. Excellent results will now be obtained by injecting a solution of aromatic sulphuric acid, twenty drops to four ounces of water being the usual strength used; the injections should be repeated every three hours, preceded by urination. If the mixture proves too stimulating, it is sufficient evidence that the acute inflammatory action has not subsided, and the hot soda solution should be continued for a longer time, at least until the acid mixture can be used without causing extreme irritation. After a few days use of this injection, the discharge proving obstinate, resort may be had to the use of protargol, a metallic silver compound, in a one or two per cent solution, three or four times a day.

To protect the clothing from the discharge, place a portion of absorbent cotton over the glans penis, it being retained by drawing the prepuce over it.

Complications must be treated as they arise; chordee demands that the patient sleep on the side, on a hard mattress, and under light coverings. The bowels should be emptied before retiring, with glycerine and water given by enema, followed with a suppository composed of the following remedies:

℞.
Codeine ....-....................grs. vij.
Ext. Hyoscyami ....
Ext. cannabis indica, āā ....grs. ij.
Cocoa butter. q.s. to make suppositories No. 12.
Sig.—Use one per rectum when needed to restrain erections
caused by urethral irritation.

The administration of gum camphor and bromide of soda
are not without their soothing effect at this time.

Much of the treatment administered in chordee will give
good results in cystitis, and in connection, the patient should
avoid active exercise and stimulating food and drinks. Re-
course should be had to hip baths in hot or cold water, as
proves most comforting to the patient, and give teaspoonful
doses every hour or two of:

℞.
Spec. tr. Gelsemium ....ʒ j.
Spec. tr. cannabis indica ....gtt. xx
Sulph. of magnesia ....ʒ j.
Aqua dest. q.s. ....-...........................fl. ℥ vj.
M. Sig.—

If hemorrhage occurs from rupture of the urethra, it may be
arrested by applying compresses to the perineal region wrung
out of ice water, but more efficient will be the deep injection
of a solution of adrenalin chloride, one drachm to an ounce of
water.

Edema of the foreskin is the result of great urethral irri-
tation, and is aggravated by the use of stimulating injections.
The condition may lead up to that of phimosis. To relieve the
abnormal condition, where the cellular tissue is infiltrated with
serum, the parts should be spudded with a sharp narrow-bladed
knife and the organ wrapped in cloths wet in witch-hazel and
kept turned up against the abdomen.

A swollen testicle, or orchitis, is also commonly the result
of strong injections. It may result from lifting, running and
jumping, and injuries to the parts. The organ is inflamed, and
extremely painful to the touch.

The treatment requires that the patient assume the recum-
bent position, and apply cooling and evaporating lotions to the
parts. A mixture that gives excellent results here is:

R.
        Carbonate of potash ....ℨ j.
        Tincture of opium ...-.........................ℨ vj.
        Warm water ....fl. O j.
    M. Sig.—Bathe the tumefied part and wrap in dry cotton.

The bowels must be kept open with broken doses of sulph. of magnesia, and pain subdued with hypodermic injections of heroin. As soon as the acute swelling has subsided, the swollen testicle should be strapped, using the oxide of zinc adhesive plaster as the medium. Should the tension in the tunica vaginalis prove severe, relief may be promptly obtained by puncture, using for this purpose a long, slender, surgical needle. As the swelling subsides, and the dressings loosen, they should be removed and reapplied, the testicle at all times kept elevated toward the abdomen.

One of the serious complications of gonorrhea is stricture; like most of the others it is apt to be the result of irritating injections. Traumatism and ulceration may also be provoking causes. Chronic gleety discharges usually denote the abnormal state, and call for special treatment. After washing out the urethral canal with a mild solution of biborate of soda, carefully pass two or three graduated olive-pointed sounds, commencing with about a No. 8; this may be much too large and a smaller one should be selected. After once passing the strictured part, those of a larger caliber should be tried, till at least a No. 14 can be introduced; care must be taken at all times not to go beyond the prostate. In passing the instrument, the surgeon should bear in mind the natural trend of the urethra, keeping the instrument in the median line, and holding it with a firm hand; the penis, grasped with the left hand, is gradually stretched forward on the instrument, care being taken not to display too much force during the manipulation. Should a false passage accidentally be made, withdraw the sound and make no further attempt to pass it for ten days to two weeks. In cases of retention of urine, being unable to give relief with the catheter, tapping the bladder will be in order, which is executed with a curved trocar, either above the pubic bone, or through the rectum. Organized, indurated strictures that will not yield to the passage of the steel sound, demand incision with a urethrotome, Otis preferred. The operation is done under general or local anæsthesia, after

Fig. 335.—Pratt's double end, nickle-plated steel sound.
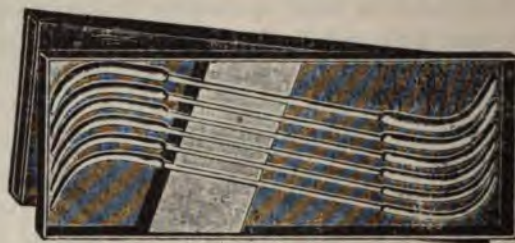
Fig. 336.—Fowler's urethral sounds.

Fig. 327.—Metal sounds—including Gouley's tunneled sound, for use with filiform bougies; Casper's grooved sounds, for treatment of chronic gonorrhœa; Van Buren's cupped sounds, for applying ointments.

the urethra has been cleansed with some antiseptic wash. Following the operation, the passage of a No. 14 sound every second or third day is in order; during the first few days the patient should keep his bed and partake of a light diet, keeping the bowels open with broken doses of salts.

The treatment of gonorrhea in women requires rest in bed, when this is possible, bowels kept open with mild laxatives, and

a diet composed of milk, rice, cereals, and demulcent drinks
Frequent injections should be given, first of borax water, a
teaspoonful to the quart of warm water, and repeated every three
hours. In a week the acute symptoms will have subsided, when
the injection fluid should be of a more astringent nature. The
permanganate of potash is a potent agent here, used in strength
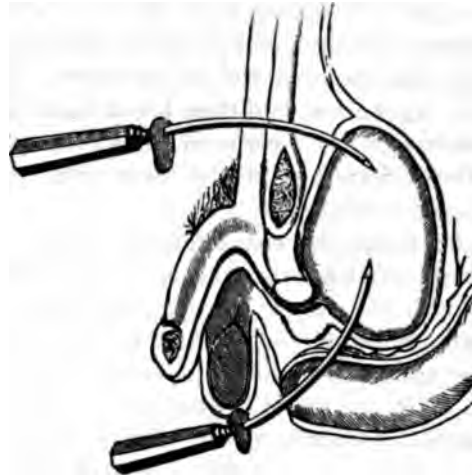
Fig. 338.—Tapping the bladder above the pubic bone and
through the rectum. (*Howe.*)

of ten to fifteen grains to the pint of warm water three times a
day; later a stronger solution may be used with better effect;
weak solutions of acetate of lead and sulphate of zinc are also
efficient agents in checking the offensive discharge. A fountain
syringe is the best medium for the application of all washes and
injections. The labia should be separated by pledgets of ab-
sorbent cotton wet in borate of soda solution, and the external
soft parts bathed in the same several times during the day.

GUMMATOUS AFFECTIONS

Gummata are soft pulpy tumors appearing upon different
portions of the system during the tertiary s   yphilis.
These growths are prone to spring
membrane; hence we observe th

of the larynx and pharynx, lungs, liver, and spinal canal. They may appear upon the skin surface, where they are known as tubercular or ulcerative syphilides.

The growths vary in size from that of a pea to a tumor as large as a small egg, and are composed of cells round and epithelial in character.

When these growths spring from the liver, spleen or other soft structure they develop rapidly. They are not exceedingly vascular, nor are they very painful to the touch. They develop to a certain size, degenerate, and then break down in ulceration. Gummata appearing on the tongue or in the pharynx are of an ashen color; those forming on the liver and other internal organs are of a yellowish hue.

There are no symptoms characteristic of the morbid state, other than irritation and distress caused by the growth when it forms in the mouth and throat. A nervous train of symptoms has been known to follow the formation of a gumma on the coverings of the spinal cord, which is entirely due to pressure

Treatment. The treatment of gummatous growths is mostly by remedial agents of an antisyphilitic nature. Some of the most potent of the vegetable antisyphilitic remedies may be of value in the treatment of these growths by their systemic effect, especially when combined with some of the active chemical agents, whose action is known to check or at least to modify the syphilitic poison in the system; the specific tincture of phytolacca, iris, berberis, thuja and trifolium should be thought of in this connection, especially the latter, given in alternation with potassium iodide in five to ten grain doses three times a day well diluted with water. The protiodide of mercury, in doses of one-sixth grain, in pill form, may be given with every promise of good results, in many cases of tertiary syphilis, with gummata appearing upon mucous surfaces. Iodide of strontium in five grain doses every four hours will prove curative in scrofulous states as will iodide of iron in pronounced cases of anemia.

To gummata appearing in the throat and mouth, a strong solution of sulphate of copper should be applied once or twice a day, or in place of this active agent, a mixture of biborate of soda, salicylic acid and glycerine may be used with marked curative effect, especially in cases where the gumma has broken

down in ulceration. The above mixture is prepared in the following proportions:

℞.
   Biborate of soda ....—.........................ℨ ij.
   Salicylic acid ....₊...............gr. xx.
   Glycerine .—............ ....fl. ℨ j.
  M. Sig.—Apply to gummatous patches three or four times a
  day.

During the time the patient is under treatment for the gummatous tumors, some attention must be paid to his hygienic surroundings; the bowels should be kept open, and the function of the kidneys kept stimulated to action. Frequent bathing in mineral water will keep the skin in normal condition and exercise in the open air will stimulate functional activity generally.

The diet should consist of nutritious and easily digested food. Alcoholic and malt liquors should be eschewed.

PART TWENTY-THREE

Lesions of the Breast

TUBERCULOSIS OF THE BREAST

Not infrequently the breast becomes the seat of tuberculous inflammation and deposit of morbid material that is cheesy in character and is prone to break down into purulent fluid, once pyogenic germs find entrance to the cheesy mass. When the lesion commences in the skin, it is known as lupus, a morbid condition fully described under a separate head in another part of this work.

The deposit of tuberculous matter in the glandular substance sooner or latter excites inflammatory action, whether it be diffuse or localized. It is possible for a collection of tuberculous matter to take place and gradually enlarge by outside accumulation of the caseous material and remain as such, as it is quite generally understood that the morbid material will not break down into purulency without the presence of septic germs.

If purulency results from infection of the deposit, the axillary glands inflame, and soon become enlarged and tender on pressure. Abscesses may form in the breast, the pus gradually sloughing its way to the surface, leaving sinuses that can not be healed and remain so.

During the progress of the disease, there will be periods of hectic fever, variable appetite, pain and soreness in the breast. The tumefaction will vary in size in accordance with the length of time the morbid condition has been developing. There is a history of tuberculosis in other parts of the system where the deposit in the breast is diffuse or where the cheesy nodules are scattered throughout the breast.

Treatment. Incision and removing the localized collection of cheesy matter with a sharp curette is the course usually pursued in the local form of the disease, and the removal of the

entire gland, together with the axillary nodes and the lymph-channels extending to them from the breast in cases that show pronounced infection.

Following the operative work, the general health should be looked after. The patient should be advised to live much of the time out-of-doors, salt baths should be indulged in several times a week, and sluggish functional organs should be stimulated to normal action with such medicinal agents as the individual case will require. Good nourishing food and regular habits will go a long way toward eradicating the disease.

SYPHILITIC LESIONS OF THE BREAST

A woman nursing an infant other than her own that has a syphilitic lesion in its mouth, will contract the disease and have the initial sore appear on or near the nipple. The disease will not appear as a tertiary phase of the morbid affection, but comes on during the secondary stage, as it is during this period in the progress of the pathological entity that the mucous patches are exhibited in the mouth of the nursing infant. The indurated sore on the nipple may appear within ten days to two weeks from the time the child was first put to the breast, the woman from that time on suffers from secondary manifestations of the disease, but may escape the ravages of the tertiary phases, owing to the lack of virulency of the infection virus imparted by the child.

Within a few weeks or months after the primary lesion appears on the breast, the axillary glands will become tender and swollen, gummata sometimes appearing in the subcutaneous tissue, but are rare, mucous patches generally appear in the mouth and throat and condylomata are frequently seen on some portion of the body.

The nature of the primary lesions in the nursing woman, and perhaps the history of the infant, together with its general physical condition will go a long way toward establishing a correct diagnosis of the case.

The treatment of the presenting conditions will require both local and general measures. The mucous patches should be painted over once or twice a day with a strong solution of

sulphate of copper—a drachm to the ounce of water—or touched with the copper pencil. The primary nipple lesion will readily yield to the application of the same potent agent, as well as a mixture of salicylic acid and biborate of soda in glycerine, as per the following formula:

℞.
Biborate of Soda .... ℥ ss
Salicylic Acid .... gr. xx
Glycerine ....fl. ℥ ss
M. Sig.—Apply to the ulcerated patches three or four times a day.

To overcome the systemic taint, the patient should be given internally, the following prescriptions:

℞.
Spc. Tr. Phytolacca .... ℥ j
Spc. Tr. Echinacea .... ℥ iij
Peppermint Water, q. s. ....fl. ℥ iv
M. Sig.—A teaspoonful every two hours.

The following prescription may be given in alternation with the above mixture with benefit to the patient:

℞.
Spc. Tr. Corydalis .... ℥ ij
Fowler's Solution .... ℥ ss
Aqua Dest., q. s. ....fl. ℥ iv
M. Sig.—A teaspoonful every two or three hours during the day.

Murcurius and aurum taken in alternation, will greatly benefit secondary phases of the disease, if taken in small doses and frequently repeated.

The general health of the patient should be maintained by a diet that is appetizing and nutritious, and complications should be met with the indicated remedies as they arise.

TUMORS OF THE BREAST

Tumors of the breast may be classified as benign and malignant. The benign variety embraces a large number of growths, each differing from the other in its tissue formation or form of development. They may be cystic, fibrous, fatty and vascular in character, depending upon the character of the structure in which they originate.

In determining the presence and characteristics of a growth in the breast, it will be necessary to have in mind the conditions of the normal gland while making the examination. The normal gland is not hypersensitive to the touch, is not irregular in contour, nor is there present density of portions of the gland. If such conditions are present, a morbid state of the breast is surely developing.

A tumor, however small, developing near a nerve will provoke a certain degree of pain, which is lancinating or neuralgic in character. Cystic tumors, forming near the milk glands, are apt to excite a slight discharge of mucus from the nipple. If the discharge becomes serous and tinged with blood, there are strong indications of malignancy.

Benign growths maintain a somewhat even contour while developing, are of slow growth, not overly painful or sensitive, while the reverse is the case in cases of malignancy; besides, malignant tumors contaminate the lymphatic vessels and glands in the axilla which usually complicates the primary affection to a greater or less degree.

Cystic growths, if very tense and seated deep in the structures of the breast, are often mistaken for fibrous and malignant tumors. To make sure of the nature of the growth before excising the gland, a large hypodermic needle may be sent into it thus obtaining some of the fluid, in case it is cystic.

Galactoceles are one form of cystic growths that develop in the milk gland near the nipple; the secretion is a thin serous fluid mixed with milk. Cystic tumors occur in women during and after middle life and may be single or multiple.

Treatment: The treatment of tumors of the breast is by incision, excision and aspiration. The fluid of a cystic growth may be removed by aspiration, the cavity injected with a few drops of pure carbolic acid and manipulated so as to bring the caustic agent in contact with every portion of the secreting surface; the irritation that the acid sets up often brings about a cure. A more satisfactory method is to lay open the cyst, evacuate the contents, pack the cavity with strips of sterile gauze for two or three days, following which it usually heals by granulation. Breasts extensively affected with cystic growths, call for excision of the entire gland.

Fibrous and mixed tumors which develop in the glandular structure of the breast are best removed by excision, thus removing a portion or all of the lobe from which the tumor springs, if the indurated mass cannot be peeled out after cutting down upon it. If there are several small tumors, they may be so situated in the breast that they can be removed through one in-

Fig. 339.—Lines of incision for amputation of the breast, and for the purpose of clearing the axillary space of enlarged glands.

cision. If the tumor is large, involving most of the breast, the entire gland should be excised through an elliptical incision in the skin and fascia, reflecting back the flaps a sufficient distance to remove the growth, returning the flaps afterward and uniting their margins over the chasm, covering over the wound with sterile gauze pads which are retained with strips of zinc oxide plaster. In cases of large tumors, the cavity should be drained for a few days following the removal of the tumor.

Tumors of a malignant type are to be treated by excision; not only should the entire breast be removed, but the lymphatic vessels, and glands that are situated in the axilla and adjacent tissue should also be dissected out. In cases of long standing, where the growth has involved the overlying integument and pectoral muscles, attended with marked systemic disturbances indicated by pale features, hectic fever, loss of appetite, edema of the arm and surrounding tissue, and general malaise, operative procedures are contraindicated. If the patient should survive the shock of operation, she could not hold out long against

the devitalizing effect of the general anemia usually present in these cases. While life lasts, the patient should be kept comfortable, with an occasional dose of codeine or heroin, which will not only assuage pain, but will give a needed amount of rest and sleep. A generous diet of appetizing foods and supporting stimulants should be freely partaken of.

HYPERTROPHY OF THE BREAST

Hypertrophy of the female breast is commonly due to augmentation of the glandular structure of the organs. There are two periods in the life of the female when this morbid condition occasionally makes its appearance; first near the age of puberty, and second, at about the climacteric period, although it is occasionally observed in women of lymphatic temperament in connection with pregnancy between these ages.

When this rare condition occurs early in life of the female it is generally bilateral; at a later period one breast is often found to be much larger than the other and not infrequently the growth is found to contain cysts of various sizes, containing a serum-like substance of the color of weak coffee, or of a slight milky hue. In either case the breasts often develop to a large size, weighing from ten to fifteen pounds, causing an embarrassing deformity to the woman thus afflicted.

The development of the growth at or near puberty is, in some instances, very rapid, and in others slower; it generally requires a year or two for it to reach maturity. Again the development may be rapid for the first two or three months, then cease for years, when if pregnancy should take place, the tumor may commence to grow again.

In cases of late development, the interior of the breast feels hard and quite tender, especially in the diffuse variety, and occasionally the nodular mass becomes the seat of malignant infiltration that soon manifests its true nature by causing a retraction of the nipple, a gradual loss of flesh and weight, and the patient becoming weary by the weight of the morbid growth.

Owing to the fact that the tendency of the morbid state of the breasts is to eventually enfeeble the patient, she should be relieved of the burdensome growths by their removal by amputation, especially in such cases appearing at or about the period of puberty.

If the already enlarged breasts take on a secondary development during pregnancy they should be supported by a wide bandage or sling with the hope that in time succeeding confinements may reduce them in size.

If amputation is decided upon, skin flaps from either side of the enlarged breast should be provided for when making the incision to span, if possible, the gaping wound after the gland is removed.

At the conclusion of the operation, the patient should be kept at rest in bed and the wound dressed as occasion requires with sterile pads, which should be held in place with a wide band or adhesive strips. Fever and other morbid conditions occurring after the operative work is done, should be relieved by sponging with tepid water or by the administration of such remedial agents as the individual case may require.

AFFECTION OF THE NIPPLES

The nipples are subject to inflammation caused by nursing, excoriation, and traumatism. As a result of the inflammatory action, fissures often appear about the nipple which, if infection occurs, frequently terminates in painful ulceration and sometimes suppuration.

Not only the nipple, but the skin surrounding it, becomes red, tender to the touch and very painful. In the worst cases, there is often fever, thirst and restlessness, and the patient becomes peevish from the loss of rest and sleep.

Treatment: The treatment consists in removing the cause, when possible, and the topical application of such antiseptic washes as the individual case will suggest. The alkaline antiseptic frequently referred to in this work will prove beneficial in most cases, especially in nursing mothers. After each nursing, the nipple should be bathed in luke-warm saline solution, follow-

ing which the alkaline solution should be applied, either with a cotton swab or a pledget of cotton; gauze can be applied wet in the antiseptic mixture. Excoriated and fissured nipples improve rapidly when not too highly inflamed, when dressed with the following solution:

℞.
    Lloyd's hydrastis .... ℥ ss.
    Fl. ext. Calendula ....-............. ℨ vi.
    Aqua Dest. ....q.s. fl. ℥ iv.
    M. Sig.—Use topically several times a day, especially after
    each nursing.

Ulcers and very deep fissures should be touched with a five per cent solution of silver nitrate, after rendering the open sores anæsthetic by the local application of four per cent solution of cocaine. The caustic solution may be used every other day until three applications have been made, unless contraindicated. Dilute tincture of arnica is also useful in the treatment of sore nipples, as is phytolacca. Rubber shields should be placed over the nipples when nursing.

Congenital Malformation.

Congenital absence of one or both nipples has been noted in several cases. The deformity here is always due to an arrest of development. It may also be absent as a result of disease. the conical eminence first becoming ulcerated and later attacked with gangrene, which sloughs it away.

A cleft or bifid nipple is not infrequently observed and a long and a pendulous condition may exist. Supernumerary nipples and breasts are quite commonly met with in women and have been observed in the male sex.

Surgical measures are required in the treatment of these cases of malformation only when symptoms of a troublesome nature arise. The character of the operation will be determined by the conditions present in each individual case. Excision is usually the operation required.

Paget's disease of the nipple is a dermatitis of the most obstinate character. The morbid state is not confined alone to the nipple; it often spreads out over a considerable area of the breast. involving all of the layers of the skin and the fascia beneath. in cases of erosion. the parts being red and very sensi-

tive to the touch. Like eczema, the surface of the skin is more or less inflamed, and often exudes a thin, pasty secretion, which soon dries, forming a crust over the affected area. There is a sensation of itching and tingling in the part, and any attempt at relief by scratching causes acute pain.

Treatment: The usual treatment of eczematous states avails but little good in the treatment of the worst forms of Paget's disease. The following mixture has accomplished many cures when its use was commenced before the subcutaneous tissues became seriously involved:

R.
    Biborate Soda ....gr. xxv.
    Salicylic Acid ....℈ ss.
    Liquid Petrolatum ....fl. ℥ j.
    M. Sig.—Apply to excoriated and ulcerated surface twice
    a day.

This preparation is of special benefit in the above affection, when a tendency to malignancy becomes manifest.

Its potency may be increased or diminished to meet the requirements of individual cases, even to adding a few grains of chloride of zinc, or lessening the amount of acid. If no benefit is derived from this local treatment, and the disease seems to grow persistently worse, the breast should be completely removed.

MASTITIS—MAMMITIS

Inflammation of the breast is commonly met with in the every day practice of the medical man, and may be due to traumatism, exposure to severe cold, to severe systemic disease and to infection occurring through little cracks or excoriation of the nipple during the nursing period.

The morbid condition is divided into the acute and chronic forms; the acute disease is usually observed soon after childbirth, while the chronic form is generally noted in connection with some systemic taint, as tuberculosis. When due to the latter cause, both the areolar and glandular tissues of the breast are involved. Infection finds its way into the gland through the milk ducts, lymphatics and blood vessels.

In cases where the inflammatory action is not high, it may subside without destruction to tissue, while on the other hand, the inflammation is followed by suppuration, ending in abscess formation near the surface or deep within the gland. In the acute form, besides the inflammation, there will be marked tenderness, acute pain, redness of the surface and a sense of weight in the affected gland. If suppuration ensues, fluctuation may be obtained by manipulating the affected area, unless deep seated.

During the stage of suppuration, the patient will complain of rigors, hectic fever, thirst, headache and malaise; the bowels are usually constipated and the patient voids but little urine; the appetite is variable and occasional periods of sweating is a common feature.

Treatment: The object to be first sought in the treatment of the morbid state is to relieve the inflammatory condition of the tissues and the overburdened state of the milk-glands of the breast. At the outset, the patient should be kept at rest in bed upon a mild diet, while the breast is covered with quite warm fomentations of hops and stramonium leaves, in acute cases, while the milk-glands are kept empty with the breast pump. The fomentations should be applied hot and changed every thirty minutes for about two hours, followed by a dressing of cotton and comfortably bandaged; the process should be repeated after a wait of two or three hours. The bowels should be kept open with saline laxatives, and the action of the kidneys free with the acetate of potash. This course will abate the inflammatory symptoms and check the liability to suppuration.

The child need not be taken from the breast unless suppuration occurs in the milk-glands, involving the milk-ducts; under such conditions the abscess should be opened at once, the incision being made on a line radiating out from the nipple, thus avoiding injury to the milk ducts. Not infrequently the collection of pus takes place well beneath the glandular structure, and to reach it a punctured incision should be made from some point near the periphery of the breast. After the evacuation of the purulent fluid, the character of the abscess will determine whether or not drainage should be provided for to keep the cavity clean. After evacuating the pus, the cavity should be cleansed with

warm boric acid solution, or peroxide of hydrogen. Following each dressing, a cotton pad should be placed over the breast and a bandage snugly applied.

Internally, during the acute stage, aconite and phytolacca are usually indicated to control fever and the glandular swelling. When suppuration seems inevitable, the above-mentioned remedies should be alternated with liberal doses of echafolta or echinacea.

Following the evacuation of pus, the patient should be given peptics, stimulants and tonics, with the best of nourishing foods.

The chronic form of the disease differs from the acute attack in the character of the appearance, swelling, pain and induration of the gland. Following the acute attack, the breast often remains indurated, as a result of the inflammatory deposit and exceedingly tender and painful as a result of pressure. In cases where the outer portion of the gland is mostly involved, the milk-ducts often become occluded, resulting in cystic development more or less serious in its nature.

Often the breast atrophies, leaving hard lumps near the center of the gland, somewhat sensitive to the touch and composed mostly of fibrous tissue. These indurated masses are not very painful except, perhaps, at the approach of the menstrual period, when the breast becomes in a measure swollen and sensitive to the touch. After discovery, the individual is apt to associate the morbid condition with that of cancer, and will be on the lookout for enlarged axillary glands and other external evidences of malignant disease.

The surgeon, when consulted regarding the morbid changes in the gland, should not deceive the patient by scouting the idea that the indurated areas occluding the milk-ducts may not eventuate in growths malignant in nature, as such conditions have been known to terminate in cancer.

Chronic cases of mastitis are seldom amenable to medicinal treatment. If the character of the diseased breast is such as to lead to a suspicion that the lumps in the gland may develop into malignancy, it had better be removed at once. Following the operation, the patient should be put on arsenic, and the lime salts to improve the condition of blood, and ordered to take out-door exercise and eat a nutritious and stimulating diet.

GALACTOCELE

As a result of some morbid process, generally inflammatory action set up in the milk duct or gland, by injury or disease, a cystic tumor develops, the contents of which is a milky fluid that in the course of time becomes of the consistency of heavy cream, and has the color of cream cheese. The tumor mass is usually discovered early by the patient, and the surgeon is soon appealed to for a positive diagnosis, there existing a suspicion, on the part of the individual and friends, that the growth is of a cancerous nature.

The cystic tumor is not of rapid growth, and is generally devoid of symptoms, except in cases where the infective germs find lodgment in the milky fluid. Under their influence the fluid changes to a yellowish-green color, and is sufficiently irritating to excite more or less fever. There is pressure pain in cases where the cyst develops to a considerable size.

Treatment: The treatment consists in the evacuation of the pent up fluid and cleansing the cavity with a bichloride or the alkaline solution, and establishing drainage if the nature of the case requires it. If the cyst develops near the surface, it may be opened with a sharp bistoury; if it forms deep in the breast, it will be best to use a medium sized trocar and canula.

The external wound should be dressed with sterile gauze and strapped with adhesive plaster.

If required, the strength of the patient should be supported with small doses of Elixir glycero-phosphate of lime and soda, strychnia, quinia and iron, with rich soups, broths, milk, buttermilk and eggs as a diet. The bowels should be kept open with the salines, and the function of the kidneys kept active with stimulating diuretics.

PART TWENTY-FOUR

Lesions of the Rectum and Anus

STRICTURE OF THE RECTUM

A contraction or stricture of the lumen of the rectum may be due to tumors, abscess formations, foreign bodies, and severe inflammatory conditions. Seldom are the bowels constricted at more than one place.

The stricture may consist of merely a narrow ring of cicatricial tissue surrounding the rectum, or the lumen of the bowel may be narrowed by the deposit of morbid products to the extent of an inch or more. The bowel may be only partly occluded, allowing the fecal contents to pass through the constricted portion; the condition is known as partial stricture. When the lumen is completely occluded, there exists a condition of complete stricture.

The symptoms accompanying stricture of the rectum vary according to the etiological factors causing the morbid condition. Chief among the symptoms common to every case, is the difficult defecation, which is more or less intensified according to the degree of the obstruction. Straining at stool (tenesmus) is another common symptom that may be mild in character in cases of partial obstruction, but frightfully distressing in other cases approaching complete occlusion of the bowel. Constipation is an early symptom, which becomes more pronounced as the morbid state progresses. In the late stages of the affection, the constipation is very apt to be alternated with diarrhœa. Pain is present in nearly all cases: mild in the early stages, but distressing in the latter stages of the disease. It is not confined alone to the rectum; but radiates up the back, down the limbs, and throughout the pelvis and abdomen. As the bowel is not completely emptied in an effort at stool, an inclination soon

manifests itself to again evacuate the rectum with but little hope for relief.

The constant effort at stool, the pain and distress that follows, the general disturbance of the nervous system, soon begin to make inroads on the patient's physical condition, which is shown by the pale, pinched features, restlessness, loss of sleep and appetite; the tongue is found with a pasty yellowish-white coating and the breath is usually very offensive. The character of the stools may be of some diagnostic value. If the stricture is low down in the rectum, the expelled feces, much of the time, are in shape much like a ribbon, or round and small and often long drawn out.

In cases where the constriction is rather high in the rectum, the fecal matter passes through the stricture in a semi-solid form and, collecting in the lower portion of the bowel, soon provokes a stool more or less normal in shape, and somewhat hard in character.

In severe cases of stricture of the rectum, due to ulceration peritonitis often supervenes and remains a feature of the disease until the stricture is cured.

Pruritus ani, caused by irritating discharges from the rectum, is a complication frequently met with in rectal strictures. Other local diseases, such as fissures and fistula, abscesses and piles, often appear as a result of the circulatory disturbance, the cure of which is long delayed unless the constriction is early relieved.

To definitely determine the presence of a stricture of the rectum, the finger is smeared with some antiseptic lubricant and introduced into the lower bowel and, unless the constriction is out of reach, every phase of the morbid state can be correctly outlined. Where the strictured area is situated high in the rectum, the degree of constriction can only be determined by graduated bougies with olive-shaped tips.

Treatment: The treatment of rectal stricture is by both medical and surgical measures. At the outset, the cause of the morbid condition should be ascertained and measures adopted to remove it. If the stricture is not complete and not complicated with malignant ulceration, it can usually be overcome

gradual or forcible dilatation. The former method is the one most frequently resorted to, as it can be put in practice without pain and with but little inconvenience, graduated bougies and anal dilators being utilized for the purpose. Besides, there is some danger of rupturing the constricted portion by forcible divulsion, especially if the stricture is situated well up in the
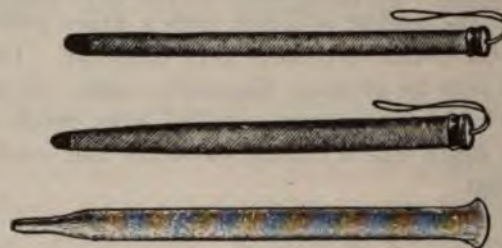
Fig. 340.—Rectal bougies.

rectal pouch; following such an accident, peritonitis is quite apt to supervene, often terminating fatally. The procedure is applicable and safe in cases where the constriction is situated within two inches of the anal outlet, in non-malignant cases, and can be accomplished in a minute or two, while the patient is under chloroform anæsthesia. Gradual divulsion often requires a long period of time to accomplish permanent benefit, and even then the dilators should be resorted to occasionally to prevent a return of the morbid condition.

Abscesses, if present, should be opened and the contents thoroughly evacuated, and tumors, if non-malignant, removed.

Electrolysis is recommended by many surgeons of note, to aid in dissolving the indurated mass of tissue composing the constricting medium; the result, however, is hardly satisfactory enough to justify the time and expense the patient is put to, to follow it up any length of time.

If the stricture is annular in character and too firm to yield readily to forcible dilation, the rectum should be irrigated with boric solution, and a speculum introduced as far as possible, exposing the narrowed opening through the strictured area; through which a bistoury is introduced and made to divide the indurated ring in three places (internal proctotomy), being careful not to cut entirely through the bowel; partial dilation should

then follow, the rectum cleared of fluids and fecal matter and then packed with sterile gauze, wet with the alkaline solution, to maintain the dilation and check hemorrhage, if any follows the division of the stricture.

Many surgeons prefer executing external or posterior proctotomy to doing an internal division of the stricture. The operation is safer and gives results equal to, if not better than the internal operation. It is only the worst cases that will justify the execution of the posterior operation.

The successive steps of the operative work are here briefly stated; after the rectum, anus and surrounding parts are thoroughly cleansed, and the hair shaved off, the patient is placed in the lithotomy position, with the limbs well flexed and held by straps attached to the stirrups. A speculum should dilate the anus, exposing the constriction; a long sharp pointed bistoury is introduced through the aperture of the stricture and made to take a position upward and backward near the sacrum; as it is withdrawn, it is made to divide all of the tissues posteriorly to near the tip of the coccyx, including the lower part of the rectum, sphincters, skin, fat and fascia. The margins of the wound are retracted and all bleeding vessels are at once picked up and twisted or secured by ligature. The wound and exposed rectum are irrigated with some antiseptic solution and packed temporarily with antiseptic gauze and the patient placed at rest in bed. The wound should be kept clean with weak bichloride or other antiseptic washes and gauze packing for two weeks or more, and as the wound heals, a good sized rectal bougie should be passed occasionally to prevent a recurrence of the constriction. Feverish states following the operation can be controlled with veratrum and gelsemium or acetanilid, and pain for the first few hours controlled with one-eighth grain of heroin or morphine hypodermically administered.

Excision of the strictured portion of the gut has been advised by some eminent surgeons, but the results have not been as gratifying as the advocates of the method had hoped for. Unless the union of the severed end of the bowel to the skin margins at the anus is perfect, there is likely to be left more or less of an ulcrated surface that will ultimately develop into a secondary stricture.

In non-malignant stricture, where pain and distress are severe and exhaustive, prompt relief may be given by doing a colostomy, the successive steps of which are described in another part of this book.

OCCLUSION OF THE RECTUM

As a result of a faulty development during fetal life, a child is occasionally born with an imperforate rectum, which may be associated with a partial or complete occlusion of the

Fig. 341.—Occlusion of the rectum at some distance above a normal appearing anus. (*Farnum.*)

anus. The occlusion of the rectum may be due to a membranous obstruction located at some point in the rectal pouch, or, to a total absence of this portion of the large intestine, the descending colon ending at about the sigmoid flexure or below it in a blind pouch, (See Cut.)

The anus may be entirely absent, or partially occluded, being connected with the rectum by a narrow fistulous track. Then

again, the anus may be closed by merely a membranous fold of tissue, located at the margin of the skin. In every case of imperforate rectum and anus, there is of necessity a retention of meconium, and, unless the abnormal state is speedily relieved, serious symptoms soon develop; the child becomes restless and cries from pain, due to pent-up gas and retention of meconium; feverish states supervene and the pulse becomes rapid and weak; the features often become livid from constant tenesmus, and vomiting of ingesta often mixed with meconium soon become a feature of the trouble. The majority of infants born with an occlusion of the anus and rectum, die within two or three days from physical exhaustion, or serious intestinal disturbance.

In cases where there is a fistulous opening into the bladder, urethra, or vagina, the symptoms vary in accordance with the size of the fistula, and if death follows the congenital defect, it will likely be due to lack of nourishment, and exhaustion; the urine will have a fecal odor and will be mixed, in many cases, with fecal matter. The irritation and distress resulting from cystic derangement greatly exhaust the patient. Where the fistula opens into the vagina, the distress is not so great, as the opening is usually sufficiently large to enable a free evacuation of the bowel. There is likely to be more or less irritation and excoriation of the vaginal mucous membrane, but by keeping the parts clean with antiseptic douches, little pain and distress will be experienced.   .

It is not, as a rule, difficult to determine the existence of a congenital occlusion of the rectum and anus, especially when the defect is complete. It is the case with occlusion of the rectum by a membranous partition located considerably above a normally formed anus, or where the rectum ends in a blind pouch, that makes the diagnosis somewhat uncertain, at least previous to the inception of serious symptoms.

The location of the rectal defect may be determined by dilating the lower portion with a small dilator or inserting the little finger well lubricated with olive or cocoanut oil; if the anal opening is too small to admit the finger, a probe or sound may be utilized for the purpose. When the rectum ends in a blind pouch rather high up in the rectal space, the abnormal condition

may not be suspected until too late to save the patient by any measure that may be adopted. In many cases of complete absence of the anus, a small, shallow depression often marks the normal location where it should exist.

Treatment: The treatment for the relief and cure of stricture and occlusion of the rectum and anus will vary to meet the requirements of each individual case. Atresia of the anus, with a narrowing of the rectum, seldom needs other treatment than gradual divulsion, which should be done with the finger, as by this means the amount of tension displayed upon the contracted tissues can be safely estimated. Incision of the margin of the anus may be required in some cases to facilitate the insertion of the finger; if this procedure is required, it should be done under the proper antiseptic measures. This form of treatment usually extends over a period of many weeks before the congenital defect is thoroughly overcome.

Where the anus is absent and the rectum terminates in a blind pouch at some point along the rectal space, a plastic operation will be required to overcome the defect.

The operation should be done as soon as the nature of the defect is determined, and is commenced by making an incision over the site of the anus in the median line, extending it backward toward the coccyx, which may be removed if found necessary to facilitate the work. The incision is extended down through the skin, fat and fascia, when the knife is laid aside and the dissection proceeded with by utilizing a grooved director, or the handle of the scalpel, to execute the work. Upon reaching the rectal pouch, it should be opened at once and cleared of its fecal contents; the bowel is then thoroughly washed out with warm saline solution, as well as the traumatic surfaces leading up to it; the dependent portion is next seized with forceps and pulled down to the external incision at the anal site and stitched to the margins of the skin with catgut sutures. The remaining incision on either side of the artificial anus is closed with catgut and the wound dressed antiseptically.

Cases are occasionally encountered where it is impossible to bring the lower end of the rectum down to the anal site; in such an emergency, the artificial opening extending from the skin to

the blind pouch should be allowed to remain open as a fistulous track, through which the bowel frees itself of feces. In cases where this operation is not feasible, for any reason, the only alternative left to relieve the morbid state is to do an inguinal colostomy, which is described elsewhere.

In cases where the rectum is occluded with a membranous partition, it will be possible to excise the obstructive medium, if within reach, by grasping the center of the membrane with toothed forceps, holding it steady, while, with a bistoury, it is cut free from the bowel attachment by a circular incision. A stricture is prevented by occasionally passing the anointed finger or a suitable-sized bougie up past the traumatic point in the rectum. The stools should be kept loose and the rectum cleansed after each movement, if the traumatic surfaces are extensive.

In that form of imperforate anus, where there exists a fistulous opening between the rectal pouch and the vagina, urethra, or bladder, operative measures should be resorted to as soon as the abnormal condition is determined. If the fistulous opening is in the vagina, a sharp-pointed probe or groove director should be passed through the recto-vaginal opening and made to take the direction of the rectum, and forced through the skin at the site of the normal anus; this opening is next enlarged and the lower end of the rectum freed from its attachments and brought down and sutured to the skin with catgut. If the fistulous opening in the vagina does not heal by granulation, a plastic operation can be done at a later period.

More difficult to operate on successfully, are cases where there is a communication between the blind pouch of the rectum and the urethra and bladder, especially in a child only a few days old, as it could hardly survive the shock almost sure to follow the necessary amount of cutting that would have to be done to remedy the congenital defect. The proper course to pursue, however, in an attempt to correct the defect, will be the division of the tissues from the site of the anus upward, until the lower part of the rectum is reached, which in turn should be freed from its surrounding attachments and pulled down and made fast to the margins of the skin, when this procedure is feasible; other-

wise a fistulous opening may be established between the bowel and the incision in the skin at the anal site.

If these procedures are impracticable and the child's life is in jeopardy, a colostomy should be executed without delay. The most prominent symptoms requiring immediate operation are severe pain, retention of feces and great distention of the bowel with gas. To give temporary relief that is so frequently demanded in the latter condition, the bowel should be punctured with a small trocar, if it can be reached through the obstructing medium, a more thorough operation following as soon as it can be arranged for.

IMPERFORATE ANUS

This abnormal state is met with in two different forms; one in which there is no anal depression present; in the other there is an anal depression, but through a failure in evolution or development there is no communication between the depression

Fig. 342.—Imperforate anus. (*Farnum.*)

and the rectum, which frequently ends in a blind pouch. From numerous operations, it has been determined that the depth of tissue varies in a marked degree between the anal depression and the end of the bowel.

Numerous cases are on record where the rectum terminated in the vaginal canal in the congenital state of the female infant, constituting what may be termed a natural recto-vaginal fistula.

A child born with an imperforate anus, soon develops a condition of unrest, is fretful, and after the lapse of twenty-four to forty-eight hours, is constantly straining in an effort to empty the rectum. But ere this the nurse or those in attendance will have noted the defective state of the child, to relieve which the surgeon is given charge.

Treatment: Operative procedures are commenced by making an incision in the median line from about the middle of the perineum, to near the end of the coccyx, which should penetrate the skin and the underlying tissue, carefully dissecting the deeper tissues, being cautious not to cut into the rectum on approaching it; this can be prevented in a measure by retracting the walls of the incised wound while exploring for the gut. When found, the gut should be freed from its immediate surroundings and brought down to the traumatic surface; this may require the use of traction forceps or a strong suture, which may be passed through the intestinal pouch. The gut having been brought within the traumatic field, it should be secured and opened with the knife. Large quantities of meconium will at once escape, which should be aided by douches of warm water, which should be continued until the bowel is thoroughly cleaned of all excrementitious matter, followed by a douching with some one of the mild antiseptic solutions. After thus rendering the field of operation sterile, the margins of the wound in the gut are properly adjusted and sutured to that of the skin with interrupted silk-wormgut sutures. In those cases where the rectal pouch is more deeply situated, the operative technique will vary to meet the existing conditions; but in all cases, bring the exposed part of the gut down to the skin surface if possible. It may be necessary to open and free the dependent portion of the bowel of meconium before it can be liberated from its connections sufficiently to be brought down through the perineal incision.

It is a legitimate procedure to open the abdomen to aid in locating the rectal pouch and guide it down through the perineal incision, in cases where it is impossible to locate it from below.

When for any reason these procedures prove impracticable an artificial anus should be established in the lumbar or inguinal region, the same technique being followed as when doing a perineal operation.

Deep narcosis is not advised during the operative work, by many surgeons, as the attempts at crying usually force the gut down into the traumatism, which aids materially in recognizing and securing it; however narcosis should be pushed to the point where severe suffering is prevented. Following the operative work, the bowel should be cleansed, after which a three-eighths rubber tube about three inches in length should be wrapped with iodoform gauze and inserted part way into the bowel, to prevent soiling the wound with fecal matter, and to aid the escape of gases during the time the wound is healing. The perineal wound is closed with silk-worm gut sutures, which should be removed in about ten days.

PROCTITIS

Proctitis, or inflammation of the rectum, is an affection of frequent occurrence in adult life, attacking males more frequently than females. Children are subject to the disease, which usually follows acute attacks of diarrhœa, dysentary, diphtheria, and rectal irritation caused by worms.

The disease exists in both the acute and chronic forms, and may extend to all the structures of the rectum, but is usually confined to the mucous and areolar tissue.

In the adult, the causes of the disease are numerous. The acute form frequently follows traumatic injuries, impaction of feces, injuries from foreign bodies finding lodgment in the rectum, polyps and other growths originating in the mucous membrane of the lower bowel, the use of strong injections, infection from gonorrhea and syphilis, and other infectious diseases, pederasty, sodomy, and the acrid discharges following dysentery and diarrhœa.

The chronic form of proctitis presents an inflamed bowel. but the symptoms are less active in character. At the onset of the disease, the rectal mucosa is the principal seat of the inflammatory action, but in time the inflammation extends to the deeper structures, and not infrequently eventuates in abscess formations in the perirectal tissues.

In acute attacks of the disease, when due to colitis, there is a more or less profuse discharge of mucus, which may be mixed with blood and sometimes pus, with pain and severe tenesmus accompanying each evacuation of the bowel—a decided dysenteric condition of the rectum.

In the catarrhal form, the mucous membrane is red, swollen, and very sensitive, and usually covered with glairy mucus; and in aggravated cases the mucous membrane becomes abraded and often sloughs from the impeded circulation of blood.

When the morbid state is due to diphthertic poisoning about the same abnormal condition exists on the mucous membrane of the rectum, as is shown in the nose and throat when attacked with that infectious disease; although the rectal manifestation of the systemic infection is secondary in nature.

The symptoms usually observed in acute attacks of proctitis, are fever, thirst, rapid pulse, coated tongue, restlessness, frequent alvine discharges, mixed with mucus and sometimes blood, and often accompanied with more or less tenesmus and pain, a smarting and burning sensation in the rectum, especially after every movement of the bowel, and a seepage of mucus from the anus, keeping the adjacent skin moist and chafed, which often provokes intense pruritis. A macroscopical examination of the rectum will reveal a congested and morbidly red mucous membrane, usually covered with glairy mucus, and in severe cases abrasions and ulceration of portions of the rectal mucosa. In all of these cases, a digital examination will determine a marked sensitiveness of the rectum and a tight and spasmodic state of the sphincter muscle.

Treatment: The first step along the line of treatment of inflammation of the rectum will depend in a great measure upon the direct cause of the morbid state; if due to the presence of a foreign body, or the impaction of the rectum by hardened feces, these disturbing elements must be removed before anything can

be accomplished by way of remedial means to relieve inflammatory or the abraded state of the mucous membrane. Severe cases will demand that the patient be placed at rest in bed, and kept on a bland but nourishing diet. The bowels must be kept open with some mild laxative, aperient water, aided with enemas of slippery-elm or starch water, the secretions of the kidneys kept free by drinking freely of lithia and other spring waters. The rectum is to be douched every three or four hours, and especially after each bowel movement, with quite warm solutions of borax or boracic acid, followed by mild astringent washes of hydrastis or witch-hazel. Lead-water, of the strength of three to five grains, acetate of lead to the ounce of water makes an efficient astringent medication in irritable and catarrhal states of the mucous membrane; it should be used as a douche three times a day for three or four days only, when it can be supplanted by permanganate of potassium (1 to 5000) or sulphate of copper (5 grains to 3j) solutions and used as washes to the rectal mucous membrane, morning, noon, and night.

If the morbid state be due to the presence of worms in the rectum, the lower bowel should be flushed out once or twice a day with a solution of salt water, or an infusion of quassia, and in connection with this local treatment, the patient should be given twenty grains of sulphur before each meal, for a week or two. Santonin given in three to five grain doses twice a day will aid in expelling the rectal worms. The medicinal agent can be mixed with a little sugar, then taken upon the tongue and washed down with water.

. In cases where the pain and tenesmus are unbearable, great relief is obtained by introducing a suppository of codeine or cocaine in the rectum once or twice a day, and at bedtime. In place of the suppositories, an occasional enema of laudanum and starch-water will answer an excellent purpose in controlling the pain and spasm of the sphincter muscles.

If the patient will pay due regard to instructions as regards to diet, rest, and the prompt remedial measures advised by the medical attendant, prompt relief may be expected; otherwise the case will become chronic, extending over an indefinite period of time.

Treatment. In the treatment of the chronic form of the disease, two distinct varieties will be noted by the surgeon, viz.; the hypertrophic, or a puffy over-sensitive state of the mucous membrane, caused by active inflammatory action, and an increased amount of secretion of mucus or muco-pus, sometimes mixed with blood. The structural changes in the walls of the rectum caused by the high degree of inflammatory action, often eventuate in a narrowing of the lumen of the rectum, a strictured state, often giving rise to functional wrongs of the lower end of the bowel.

The symptoms of this variety of proctitis differ from those of the acute form of the disease, mainly in their severity. There is usually present an abnormal amount of muco-pus, often mixed with blood, and not infrequently abrasions or ulcerations of the mucous membrane, which often form the initial point of a fistula. A noted functional change of the bowels is a marked symptom in some cases, indicated by obstinate constipation, followed by diarrhœa, usually attended with an aching sensation, extending from the hips to the small of the back. There is in most cases, a seepage of muco-pus from the anus, keeping the adjacent skin moistened, which soon becomes chafed and very sensitive, and sooner or later gives rise to a pronounced pruritus.

The other variety of chronic proctitis is the atrophic form of the disease. It is indicated by local symptoms quite the opposite of those observed in the hypertrophic condition. Here there is an absence of mucus, the mucosa appearing dry and very tender and sensitive to the touch, and as a consequence obstinate constipation is usually present. Severe smarting and burning invariably follow each evacuation, and soon the mucous membrane becomes the seat of numerous cracks or fissures, causing acute pain during bowel movements.

Much of the treatment advised in the acute form of the disease will prove beneficial in the chronic varieties of the affection. The rectum must be kept free from irritating matter by frequent use of soothing and antiseptic washes, followed in severe cases by rectal injections of some antiseptic emulsion or oil. The following formulas have proved potent remedial agents to lessen inflammatory action, and relieve painful states:

℞.
    Llyod's hydrastis ....ʒ j.
    Salicylate of bismuth ....,....ʒ j.
    Starch water, q.s. ....fl. ʒ ij.
M. Sig.—Inject in the rectum with a piston syringe. and
    repeat the enema every four or five hours.

℞.
    Oxide of zinc ....gr. xx.
    Asepsin ....gr. iij.
    Mucilage of slippery-elm ....ʒ ij.
M. Sig.—Inject into the depths of the rectum and repeat
    every three hours.

The above formulas are efficient in the chronic hypertrophic state of the bowel. In the atrophic variety, substitute olive oil for the emulsions of starch and slippery-elm.

In dysenteric states of the colon and rectum, the following formula has served a good purpose in relieving the tenesmus and controlling the discharges:

℞.
    Spec. Ipecac ....gtt. v.
    Magnesia sulph. ....ʒ ss.
    Peppermint water ....ʒ iv.
M. Sig.—A teaspoonful every hour

Bathe the external irritated and itching parts with a one per cent. solution of carbolic acid in water, and dust the parts with oxide of zinc.

In cases of inflammation of the rectum, where the sphincter muscle is in a constant state of spasm from continued irritation, no local medicinal treatment will bring lasting relief until the sphincter has either been divulsed or incised, which should be done under general anæsthesia. If papilla, polypi, or other growths are found upon the rectal mucosa, they should be removed by snare, torsion, or incision at the outset of the treatment. Fissures are treated by the occasional application of pure carbolic acid, divulsion, or incision.

PROLAPSE OF THE RECTUM

Persons having a pronounced relaxation of the sphincter muscles of the anus suffer frequent attacks of prolapse of the lower rectum. The protrusion results from several causes, chief

Treatment. In the treatment of the chronic form of the disease, two distinct varieties will be noted by the surgeon, viz.; the hypertrophic, or a puffy over-sensitive state of the mucous membrane, caused by active inflammatory action, and an increased amount of secretion of mucus or muco-pus, sometimes mixed with blood. The structural changes in the walls of the rectum caused by the high degree of inflammatory action, often eventuate in a narrowing of the lumen of the rectum, a strictured state, often giving rise to functional wrongs of the lower end of the bowel.

The symptoms of this variety of proctitis differ from those of the acute form of the disease, mainly in their severity. There is usually present an abnormal amount of muco-pus, often mixed with blood, and not infrequently abrasions or ulcerations of the mucous membrane, which often form the initial point of a fistula. A noted functional change of the bowels is a marked symptom in some cases, indicated by obstinate constipation, followed by diarrhœa, usually attended with an aching sensation, extending from the hips to the small of the back There is in most cases, a seepage of muco-pus from the anus, keeping the adjacent skin moistened, which soon becomes chafed and very sensitive, and sooner or later gives rise to a pronounced pruritus.

The other variety of chronic proctitis is the atrophic form of the disease. It is indicated by local symptoms quite the op posite of those observed in the hypertrophic condition. Here there is an absence of mucus, the mucosa appearing dry and very tender and sensitive to the touch, and as a consequence obstinate constipation is usually present. Severe smarting and burning invariably follow each evacuation, and soon the mucous membrane becomes the seat of numerous cracks or fissures, causing acute pain during bowel movements.

Much of the treatment advised in the acute form of the disease will prove beneficial in the chronic varieties of the affection. The rectum must be kept free from irritating matter by frequent use of soothing and antiseptic washes, followed in severe cases by rectal injections of some antiseptic emulsion or oil. The following formulas have proved potent remedial agents to lessen inflammatory action, and relieve painful states:

℞.
Llyod's hydrastis ....℥ j.
Salicylate of bismuth ....℥ j.
Starch water, q.s. ....fl. ℥ ij.
M. Sig.—Inject in the rectum with a piston syringe. and repeat the enema every four or five hours.

℞.
Oxide of zinc ....gr. xx.
Asepsin ....gr. iij.
Mucilage of slippery-elm ....℥ ij.
M. Sig.—Inject into the depths of the rectum and repeat every three hours.

The above formulas are efficient in the chronic hypertrophic state of the bowel. In the atrophic variety, substitute olive oil for the emulsions of starch and slippery-elm.

In dysenteric states of the colon and rectum, the following formula has served a good purpose in relieving the tenesmus and controlling the discharges:

℞.
Spec. Ipecac ....gtt. v.
Magnesia sulph. ....℥ ss.
Peppermint water ....℥ iv.
M. Sig.—A teaspoonful every hour

Bathe the external irritated and itching parts with a one per cent. solution of carbolic acid in water, and dust the parts with oxide of zinc.

In cases of inflammation of the rectum, where the sphincter muscle is in a constant state of spasm from continued irritation, no local medicinal treatment will bring lasting relief until the sphincter has either been divulsed or incised, which should be done under general anæsthesia. If papilla, polypi, or other growths are found upon the rectal mucosa, they should be removed by snare, torsion, or incision at the outset of the treatment. Fissures are treated by the occasional application of pure carbolic acid, divulsion, or incision.

PROLAPSE OF THE RECTUM

Persons having a pronounced relaxation of the sphincter muscles of the anus suffer frequent attacks of prolapse of the lower rectum. The protrusion results from several causes, chief

among which may be mentioned constipation, piles, straining due to stricture of the urethra, urinary calculi, and the irritation caused by rectal parasites.

In appearance, a prolapsed rectum presents a mass of folds protruding from the anus, the morbid condition frequently following an evacuation of the bowel. It is an affection incident to childhood, although it may occur at any age.

When allowed to remain outside of the anal orifice for any length of time, the mucous membrane presents a congested and puffy appearance, and is returned above the sphincters with some difficulty. Cases are on record where the strangulation was so complete that the prolapsed portion became mortified and sloughed away.

Fig. 343.—Prolapse (procidentia) of the rectum. (*Gant.*)

Procidentia should be differentiated from rectal polypi, malignant growths, piles, and invagination of the bowels; some forms of the latter affection very much resemble prolapse of the rectum, but can be distinguished from it by the rectal wall remaining intact below the point of origin, while the intestine is being forced through it.

In acute cases, besides the protruding rectum, there is more or less pain, some tenesmus, and occasionally passages of blood and mucus.

The treatment of prolapse of the rectum will depend largely upon the exciting cause. If the surgeon is called to a recent case, he should lubricate the protruding part with vaseline or olive oil and reduce it; this will not be easily accomplished, if strangulated, and several attempts may have to be made, with the patient under chloroform, before it is accomplished. If the case is of long standing, and reduction is impossible, the protruding part should either be excised and the mucous membrane stitched to the skin at the margin of the anus, or allowed to slough off and heal by granulation. In children and weakly persons with relaxed rectal tissues, much benefit may be derived from the topical application of equal parts of witch-hazel and water, and minute doses of nux and other indicated remedies to improve the general tone of the system taken internally. The stools should be kept liquid in order to avoid straining and tenesmus that are usually present during defecation. Small but frequent doses of quinia, strychnia and iron, together with a rich and nourishing diet, will greatly improve the majority of cases.

Some surgeons draw the buttocks tightly together and hold them in this position by adjusting two or three strips of adhesive plaster after reducing the protruding bowel. Others advise the placing of a compress over the anus, which is held in position with a T-bandage, this being removed only when defecation takes place. Extreme cases require the patient to be kept at rest in bed a great part of the time, even using the bed-pan while lying upon the back to prevent the extreme action of the abdominal muscles that usually takes place while defecating in a sitting position; after each bowel movement, a suppository containing tannin or alum can be inserted into the rectum with good results. Hypodermic injection of escharotics into the coats of the bowel, with a view of provoking inflammatory adhesions, have met with varying degrees of success; a drop or two of pure carbolic acid, injected in several places through the section of the rectal mucous membrane involved in the protrusion, will prove most satisfactory. Linear cauterization with nitric acid, while the surrounding parts are protected with vaseline, will result in a contraction of the muscular structures of the rectum, greatly benefiting the morbid condition of the bowels.

In severe cases where medicinal treatment fails to bring about a cure, a resort to surgical measures is advised. In cases of extensive prolapse, the redundant mucous membrane may be dissected up two inches or more, commencing with a circular incision at the muco-cutaneous junction pulling down the dissected portion, cutting it off and joining the cut edge to the margin of the skin with catgut sutures.

Submucous ligation, with kangaroo-tendons or chromicized catgut, as recommended by Dr. Merrill Ricket, of Cincinnati, has proven very successful in selected cases. The tendons are placed with a partially curved needle and made to penetrate the mucous membrane only in moderate degree cases, and the muscular tissue as well where all the rectal coats are prolapsed. The needle
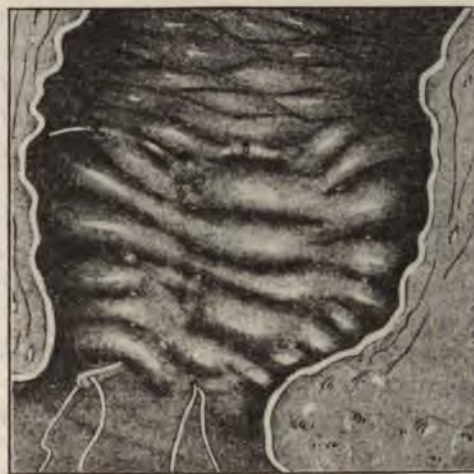
Fig. 344.—*Ricket's* submucous operation for procidentia recti.

is introduced in the mucous membrane near the anal margin, extending upward an inch and a half or two inches, where the point of the needle is made to emerge from the mucous surface; it is then reintroduced at the same point, continuing the course of a circle and emerging at the starting point. The ligature is then securely tied: marked cases of prolapse will require the placing of several of these ligatures in order to include all of the surface tissue involved. (See Cut.)

CANCER OF THE RECTUM

The rectum is frequently the seat of malignant disease, usually manifesting itself primarily, and occasionally it is met with as a secondary involvent. Seldom is the surgeon consulted with reference to the devitalizing malady before it is well under way, and the adjacent structures, especially the lymphatic glands of the pelvis, extensively involved, presenting one of the most fatal affections which the surgeon has to cope with.

Adults are more subject to the malignant disease than are persons under twenty years of age, and statistics show that women suffer from attacks of the malady more frequently than men; with them the disease is usually secondary to attacks of the disease in the vagina and uterus.

Carcinomas of the rectum have their origin in the epithelial tissue, while sarcomas are composed mostly of connective tissue, and are not as frequently met with as is cancer of this region, nor is it as fatal as is the latter. Cancer may occur at any part of the rectum; it is frequently found in the upper portion of the pouch near the sigmoid flexure and seldom at the anus. Sarcomas, when found in the rectum, are usually vascular and prone to develop rapidly, especially if they are of the small-celled variety. This form of growth is usually classified according to the nature of the cells composing the matrix.

There are several theories regarding the etiological factors connected with cancer and sarcoma of the rectum, but none of them have been fully substantiated; hence, they will not be discussed here.

More or less uneasiness, weight and sensation of fullness in the rectum, with some discomfort in the sacrococcygeal region extending down the thigh, with a disposition to frequently evacuate the bowel, are among the most prominent early symptoms of the morbid disease. Following defecation, there is often a sensation in the rectum, as if there is some thing yet to be expelled, which often provokes more or less of a tenesmus for some little time after evacuation of the bowel.

As the disease progresses, occasional attacks of diarrhœa come on, which are mainly due to tenesmus and an excessive amount of mucus excreted from the mucous glands of the bowel.

If the cancerous mass has become an open sore, the alvine discharges are frequently mixed with pus and blood. In cases where the lumen of the bowel is contracted from the ravages of the disease, or, in other words, where a stricture exists, the feces are generally discharged in the form of round pipestem-like strings, or flat and ribbon-like pieces.

There is nearly always present a thin acrid mucoid discharge from the anus, irritating in character, often giving rise to excoriation of the integument about the anal folds, and intense pruritus is frequently provoked, followed by fissures, ulcerative sinuses and not infrequently abscess formations.

About this period of the disease, the general physical condition of the patient begins to show symptoms of depletion; the appetite is variable, digestive disturbance is in evidence, the features begin to look pale and haggard, and there is loss of sleep and strength. Later, if the ravages of the disease are not staid, the rectum becomes in most part occluded, vomiting of foul smelling ingesta occurs, there is present œdema of the lower limbs, ascites, fecal abscesses from perforation of the bowel, bladder complications and great distention of the bowels from obstruction, when septic peritonitis and extreme exhaustion soon end the life of the patient.

The treatment of cancer of the rectum is entirely surgical. If the nature of the morbid growth is determined early and removed, the further progress of the disease may be arrested. Nothing short of temporary relief should be looked for from remedial measures, and these should be applied principally to inoperable cases, although such potent remedies as arsenic, iron, phosphorus and the lime salts are useful in anemic and depleted conditions of the body before and after the execution of operative measures, and if taken judiciously will prolong life. Chloral and some form of opium will be required from time to time to relieve pain, in grave cases, and to promote rest and sleep.

Opium or codein, given in suppository form with cocoa butter, is a popular method of administration to relieve rectal distress in advanced cases. Tincture of opium and starch-water also serves a good purpose, given in quantities short of provoking a movement of the bowels.

Excoriation of the skin about the anus will be relieved by frequent bathing with weak borax water, drying the affected parts and dusting with talcum powder, starch, bismuth, or oxide of zinc.

Fissures and ulcers about the anus should be kept clean with alkaline antiseptic washes, and cauterized with pure phenic acid once or twice a week until healed.

If abscesses form, they should be opened as soon as conditions justify it and subsequently dressed with antiseptic washes.

The treatment of the cancer itself with electricity accomplishes but little good. The rays of radium have in several instances, when applied to cancerous growths in the lower rectum, checked the progress of the disease, and seemingly cured it. The application of caustics should be limited to such portions of the malignant growths as may be found protruding from the anal aperture; they should by no means be applied to growths high in the rectum, as the destructive agents are likely to severely injure the integrity of the adjacent structure of the gut.

When the neoplasm is located near the anus, attempts are frequently made to remove it by curettage and proctotomy, but the results obtained are more often failures than otherwise. It is more satisfactory to execute a radical operation (colostomy) at the outset, and as this operation is described in another part of this work, the reader is referred to that chapter.

The patient should be urged to avail himself of fresh air and sunshine, whenever possible, and to pay strict attention to his diet, eating only such articles of food as are easily digested, highly nourishing, and which leaves little residue to worry a tender and painful bowel. Fruits, and such articles of diet that tend to the formation of intestinal gas should be excluded from the list of dishes.

PRURITUS ANI

Of the many diseases that come under the head of surgery none are more exasperating and intractable than pruritis ani or itching of the anus. Many patients who have suffered from

aggravated attacks of this disease, pronounce the condition most intolerable.

The itching of the anus is usually symptomatic of some other disease, such as piles, fistulæ, fissures, constipation, worms and rectal ulcers; however, cases will present that no valid cause can be found to account for the intolerable itching. The disease is more frequently observed in patients in middle life and old age, and has been attributed to errors in diet as well as to the use of alcoholic beverages to excess; pediculi and other para- sites are possible causes of the ailment. Any occupation that requires one to sit most of the time, whether doing office work or driving, is likely to bring on an attack of the disease. A patient suffering from pruritus ani suffers constantly from the itching, but the morbid state becomes more intense after retiring and the patient becomes warm in bed. If the itching accompan- ies an attack of piles, and they protrude beyond the margins of the anus, the folds of mucous membrane soon become sore and excoriated from continuous rubbing which often causes more or less pain in the regions of the coccyx from which point the pain radiates throughout the pelvis. Rubbing or scratching the itch- ing parts gives but little relief, but the inclination to do so is irresistible: the itching may stop for a time, only to return with the continued, renewed energy. The patient often looks wan and dejected from the continued loss of sleep, and even should he drop into a doze it will be for only a brief period, for he will rouse from his slumber severely scratching the already tender and itching parts.

Treatment: Ascertaining the exciting cause of pruritus ani, if it can be determined, and prescribing a course for its re- moval, is the first step in the line of cure of this exasperating affection. If the tantalizing state be the result of some con- stitutional taint, as scrofula or tubercular diathesis, much bene- fit may be obtained from the timely administration of some of the preparations of iron, phosphorus, arsenic, and lime salts. Fifteen to twenty grains of sulphur taken before breakfast and at bed time, with a few swallows of water after it, will prove of great benefit, especially if the morbid state results from rectal parasites. If there is good reason to believe that the itching is

due to error in diet, either in eating indigestible food, or eating
to excess, the fault should be corrected and a light, non-stimulat-
ing diet ordered. Alcoholic beverages of every kind must be
avoided, but fresh water should be drunk freely. Tea and coffee
and even chocolate, if drunk to excess, have been known to
intensify the pruritic state. Eczema is a common cause of the
ailment, and when this is present, the disease will present itself
in two forms, the dry inflamed and scaly condition, or the moist
or weeping condition of the skin surrounding the anus; in the
former condition, much benefit may be derived from the topical
application of the following mixture:

R.
    Tar water ....℥ ijj.
    Witch hazel ....℥ j.
    Bi-chloride of mercury ....gr. ij.
M. Sig.—Apply to the itching parts every one, two, or three
    hours. If the mixture proves too stimulating, cut the amount
    of mercury to one grain. If pomade is demanded, none bet-
    ter can be applied to relieve the itching than the following:

R.
    Ext. belladonna ....
    Ext. veratrum, āā ....gr. x.
    Menthol crystals ....gr. v.
    Cold cream ....℥ j.

This pomade will prove most effectual in relieving the tan-
talizing itching when the skin is dry and scaly, but in the moist
or weeping form, it will not prove of so marked a benefit, especi-
ally if the parts be much inflamed. Greasy or oily mixtures sel-
dom prove effectual on inflamed surfaces.

The moist form of the affection will require a soothing and
mildly astringent solution; one that has proven most effectual
is composed of the following medicinal agents:

R.
    Biborate of soda ....℥ ij.
    Salicylic acid ....℥ ss.
    Camphor water ....fl. ℥ ijj.
M. Sig.—Apply with a cotton batting swab to itching parts
    when demanded.

Dilute sulphurous acid in the proportion of one or two
ounces to two ounces and a half of water, and one half ounce of
witch-hazel will prove effective in cases of moist eczema, extend-
ing within the margins of the anus. Boric acid dusted over the

moist surfaces makes a soothing application, as does finely powdered carbonate of lead. If the skin is not broken or excoriated by scratching, much relief may be obtained from brushing the itching parts with a solution of nitrate of silver, ten to fifteen grains to the ounce of water; the application may cause smarting pain at first, but it will soon pass away, followed by a marked sense of relief. Painting the affected area with Churchill's tincture of iodine is equally as effective as the nitrate of silver solution in controlling the intolerable itching, but preceding the application of either solution, the affected parts should be anæsthetized with a four per cent solution of cocaine. For merely temporary relief from the itching paroxysms, nothing excels a two to five per cent solution of menthol crystals in liquid petrolatum, to which a few grains of cocaine can be added with decided benefit.

Another mixture that has proven beneficial in the treatment of the moist variety, as well as in the case of protruding piles, with intense itching, is prepared with the following ingredients:

R.
    Phenic acid ....gr. v.
    Oxide of zinc ....3 j.
    Witch hazel ....℥ j.
    Water, q.s. ....fl. ℥ iv.
M. Sig.—Apply on cotton to the itching surfaces every two
    to four hours.

The moist surfaces of the nates should be separated by pledgets of lint or absorbent cotton, after applying any form of medication.

If a polypus, ulcer, hemorrhoids or any other morbid condition be present and provoking the pruritus, the morbid state demands surgical attention. Whether these conditions be present or not, divulsion of the sphincter muscles should precede other surgical procedures, and if done thoroughly, decided relief will soon follow.

ANAL AND RECTAL FISTULÆ

A fistula is a suppurating track located in the soft tissues of the body. There are several varieties, descriptively considered, of which the anal and rectal are the most frequently met

with, and is usually the sequela of abscess formations, caused by extreme inflammatory action, hemorrhoids, and traumatic injuries. Surgically considered, a fistulous track located near the anal margin is called an anal fistula, and a rectal fistula if it opens higher up in the rectum.

The recto-vesical fistula is not infrequently met with, as is the recto-labial and the recto-vaginal variety, the latter communicating between the vagina and rectum, and is usually caused by parturition, while the recto-libial cases are due to abscess formations, but are rarely met with.

Fig. 345.—Anal fistulæ. A, shows a complete fistula; B, represents an internal blind fistula; C, shows a form of external blind fistula.

Fistulæ are also described as complete and incomplete; the former (typical) having reference to a suppurating track with two openings, one upon the skin surface and the other in the rectum (see cut); while the incomplete track opens in the rectum or or upon the outer surface of the body, and communicates with an abscess cavity—thus having but one opening is frequently spoken of as a blind fistula, or sinus. Should the opening be on the surface of the rectum, it is called a blind internal fistula; if upon the skin surface, a blind external fistula.

When pus gravitates for some distance from the abscess it may reach the mucous membrane of the rectum, or the skin surface, by several openings, when the morbid condition is denominated complex fistula. As many as sixteen external fistulous openings have been noted in a single case, by the author. The patient was a brewer, and gave a history of specific disease. When pus from a peri-rectal abscess opens into the bowel, and also forms fistulous tracks that course down each side of the

bowel, and open upon the skin surface, the condition is known as the horseshoe variety, and is not infrequently met with in surgical practice. (See cut.)

Recto-vesical fistula represents a communication between the bladder and rectum. The suppurating track is short, merely extending through the walls of the rectum and urinary viscus. The contents of these organs interchange, fecal matter and flatus passing through the fistulous opening into the bladder, and out
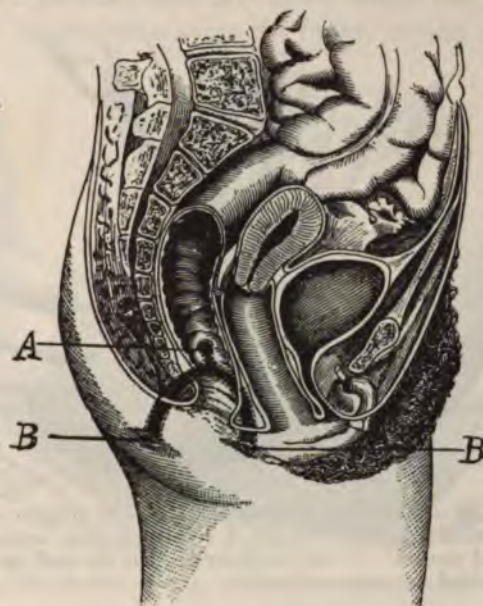
Fig. 346.—Horseshoe fistula. A, the internal opening into the rectum; B, B, the external openings upon the buttocks. (*Gant.*)

through the urethra, and urine may flow into the bowel. The usual causes of recto-vesical fistula are rupture of the bladder from kicks and blows, penetrating wounds, and very large and craggy calculi, that may set up an ulcerative process.

Persons of feeble health, especially those of tubercular and scrofulous diathesis, and such as may be suffering from specific disease, are extremely liable to fistulous diseases. Sedentary habits are prone to bring on an attack of fistula in ano, as is extreme constipation.

Rectal and anal fistulæ are more often met with after middle life, and among men oftener than women. The morbid state is not necessarily dangerous. However, the anxiety and distress accompanying the local disease beget a depressed state of the nervous system, that often hurries on a fatal termination of grave constitutional ailments. Excluding foreign bodies and traumatism, the common cause of fistulous disease in the anal region is abscess formation, and the early general symptoms are

Fig. 347.—Horseshoe fistula. The lines of incision indicate the method pursued to cause a communication between the external sinuses: It will be observed that the anal sphincters are divided but once.—(*Gant.*)

restlessness, fever, thirst, and loss of appetite, while the local symptoms are those of heat, throbbing pain, and in time a pointing or swelling upon the mucous surface of the rectum, or the outer skin surface.

Unless the real condition is determined early, and the accumulating pus evacuated later, marked symptoms are apt to supervene, such as rigors, hectic flushes, night sweats and loss of sleep; besides, multiple tracks are apt to result from the burrowing suppurating fluid.

Success may not crown attempts to explore a fistula with any kind of a probe, on account of its tortuous course; yet there will be an escape of flatus if it extends into the bowel, also in-

testinal fluids and pus to soil the patient's under garments, and provoke excoriation of the adjacent parts. A small bulbous silver probe can be so bent that the fistulous passage can usually be explored to its termination. At the same time, the surgeon should be cautious in the manipulation of the instruments, that he does not make false passages by forcing the end of the probe through the walls of the fistulous track.

The most painful cases are those where the fistula opens externally in the perineum, near the raphe, or near the tip of the

Fig. 348.—Horseshoe fistula, with numerous openings.—(*Gant.*)

coccyx. Pruritus of the ano-gluteal region is a common and often a distressing complication of the morbid state.

Cystitis is a frequent complication of a recto-vesical fistula, resulting from irritation caused by the escape into the bladder of flatus and fecal fluids.

External fistulæ are readily determined, for their external openings can be observed; but to find the internal orifice of a complete fistula often taxes the skill of the operator. It is usually located by injecting a colored fluid, as permanganate of potash, methylen blue, or milk of magnesia, through the sinus, when, with the aid of the rectal speculum, the liquid can be seen flowing into the bowel.

The true nature of a recto-vesical fistula is determined by the passage of urine with the feces, or when flatus and feces are voided with the urine. A recto-vaginal fistula is determined by the escape into the vagina of fecal matter during defecation; a like discharge determines a recto-labial fistula.

Treatment: The treatment of anal and rectal fistulæ is by both remedial and surgical measures. If the patient be weak and debilitated from some constitutional disease, carefully observe his condition and indications for remedies. Usually peptics, stimulants and tonics, in the form of iron, arsenic, strychnia, sulphur, the hypophosphites, together with nourishing foods, as eggs, beef, cream, olive oil, pickled pig's feet, custards, etc., are demanded as tissue builders, and to whip up the appetite and maintain the strength of the patient. The rapid recovery of the patient often demands a change of occupation. Those leading a sedentary life should change to some out-door occupation, where they will get plenty of sunshine and exercise in the fresh air. Frequent bathing in sulphur springs water will be of great benefit, and the bowels should be kept regulated with olive oil, cascara, sulphur, phosphate of soda, or mineral water.

Abscesses should be evacuated and kept clean, as well as the sinus or fistula, by frequent irrigation with some potent antiseptic solution, as carbolic acid, peroxide of hydrogen, salicylic acid and borax, or bichloride of mercury. To actively stimulate the healing process in the suppurating tracks, topical application should be made to them, on a small cotton swab, of some one of the following agents: Carbolic acid, 95 per cent; nitrate of silver, 20 per cent; balsam of Peru, full strength, or chloride of zinc, 20 to 30 per cent, in glycerine. These escharotic agents should be used with care, that extensive destruction of tissue does not occur. Two to four applications usually suffice to stimulate granulations. Avoidance of active exercise, and rest in the recumbent position, hasten the cure of the morbid state. Eczematous itching, and excoriated states of the ano-gluteal region, are relieved by frequent bathing of the surface with the following wash:

℞.
Carbolic Acid .... gtt. xx
Witch Hazel .... ℥ ij
Aqua Dest. q. s. ....fl, ℥ vj

M. Sig.—Use topically every two to four hours, as may be required.

Soothing powders find a place here, to control irritation of the skin surface. In general use are starch, talcum powder, stearate of zinc, lycopodium and oxide of zinc.

Injecting sinuses and fistulous tracks with a paste made of the following medicinal agents is of pronounced benefit in all cases where the method can be put in practice:

R.
  Bismuth Subnitrate .... ℥ ijss
  White Wax
  Paraffine āā .... ʒ j
  Vaseline .... ℥ ij
M.

Before using, the mixture should be reduced to liquid form by placing the container in hot water, after which enough of it should be taken up with a suitable sized glass syringe and injected into the suppurating track, after it has been cleared of pus with peroxide, and dried, in so far as possible. Care should be taken to have the bismuth well mixed with the other ingredients used as a base before filling the syringe. Aseptic care should mark every step of the procedure. Just enough of the mixture should be used to fill the fistulous openings, unless of very large size. Cavities need not be filled to get good results; besides, absorption may take place from extensive surfaces, producing nitrate poisoning.

Subsequent injections may be required in serious cases, the length of time between them being determined by the progress made in the individual case.

The strength of the mixture may be increased or diminished, to meet the requirement in any case.

Surgical measures are not applicable to patients whose general health is **vitally** depressed by disease; but operative procedures should not be discouraged where it is evident that the nagging of the local affection is hurrying to a fatal termination the constitutional malady. Usually a few weeks preparation of the patient, by placing him upon the course of medicine and diet previously suggested, will make it safe to execute any and all necessary operative work.

To execute the necessary surgical work in fistula operations, a variety of instruments should be at the surgeon's command:

Rectal and vaginal speculums, curved and straight bistouries, grooved directors, silver probes, small sharp curettes, catgut and silk for sutures and ligatures, artery and needle forceps, curved needles, blunt retractors, straight and curved scissors, and Allingham's elastic ligature carrier.

The preparation of the patient is the same as for other important surgical operations. The bowels should be moved by broken doses of sulphate of magnesia a few hours before the operation, and the rectum well washed out by enemas of borax solution, or weak soap-suds. The ano-gluteal region should be prepared in the usual way, by washing with green soap and water, and sterile water. The parts may or may not have to be shaved. The nature of the operation will determine this.

The patient's health permitting, a complete division of the ano-rectal fistula upon a groved director, after thorough divulsion of the sphincters, is the quickest, simplest, and most satisfactory method. This is done, of course, under general anæsthesia, unless the suppurating track is short and superficial, when the parts overlying the sinus can be severed without pain after anæsthetizing them with a two per cent solution of cocaine or eucaine, hypodermically administered. Indeed, it is surprising to know the extent to which operations of this character may be carried under local anæsthesia, without producing severe pain.

The first step in the operative work is to pass a grooved director through the external opening and along the fistulous track, if possible, through the inner opening in the rectum, and by the aid of the index finger of the left hand the end is brought down and made to emerge from the anal orifice. The soft structures overlying the grooved director are then divided with a bistoury as nearly as possible at right angles with the external sphincter muscle, following which the suppurating track is carefully curetted, and all necrotic tissue removed; all bleeding vessels are then secured, the wound packed to the bottom with some potent antiseptic gauze, over which pads of sterile gauze or cotton are placed and held in position with a T bandage. Any branch sinuses, should they be located, must be divided upon the grooved director, and made to open into the main track.

In exceedingly tortuous fistulæ it may be necessary to divide the track in sections, feeling the way carefully along with the probe-pointed director to the end of the pipe. In cases where the fistula opens high in the rectum, it will be impossible to bring the end of the director out of the anus. In such cases it is advised to insert a long-bladed bistoury along the grooved director till its point emerges in the rectum, when it is made to engage the end of a piece of pine, or other soft wood, which, when withdrawn, brings with it the knife, at the same time dividing the intervening tissues. Allingham's scissors and grooved director are especially adapted for this operative work (see cut). Some operators prefer to open the fistulous track from below upwards till the bowel is reached, where the inner opening of

Fig. 349.—Allingham's scissors and grooved director, used in operating on anal rectal fissure.

the track is high in the rectum. The hemorrhage, which in these cases is profuse, should be controlled by securing the bleeding vessels by ligature, or by packing the wound with sterile gauze.

It is inadvisable to sever the sphincter muscles in more than two or three places in any serious multiple sinus cases, on account of the fecal incontinence that is liable to follow, especially when the internal sphincter is divided.

The subsequent treatment requires rest in bed, and the wound kept clean with antiseptic washes; especially should the rectum be douched with a five per cent borax solution following each bowel movement. If at any time some part of the traumatism shows a tendency not to heal, the granulating process may be stimulated by applying carbolic acid to the septic area every three or four days, until two or three applications are made.

The external blind fistula leading to an abscess cavity may be enlarged, curetted and then cauterized, as well as the abscess, with pure carbolic acid, three or four times during the period of

two or three weeks, when, if the suppurating surfaces show no disposition to heal, the incomplete track is converted into a complete one by passing a grooved director as far as possible along the existing sinus, and then forcing the end through into the rectum. The succeeding treatment will then be the same as in ano-rectal fistula.

To locate the opening of an internal blind fistula is not always easily accomplished. When found, if it passes downward, its course may be followed by bending a long silver grooved director upon itself and the short end made to enter the sinus, and forced through the track till its presence is located by extending the skin and fascia, when the point is reached by cutting upon it with a bistoury. The succeeding steps are the same as those of a complete fistula. If branch sinuses be discovered, they must be opened up and cauterized.

The surgical treatment does not vary in cases of multiple or complex sinuses. The tracks must all be explored and opened up, as in the preceding cases, care being taken not to sever too frequently the sphincter muscles. In his work on Diseases of the Anus and Rectum, Gant mentions a case of multiple sinus with thirty-seven openings on the buttocks, five in the vulva, three in the vagina, and three in the rectum. On opening up the tracks he divided the sphincters at three different points, yet within three months the wounds were healed, and the patient regained perfect control of the bowel.

A recto-vaginal fistula, if not extensive, can be cured by cleansing the parts, cauterizing the sinus every third or fourth day with carbolic acid, silver nitrate, or the actual cautery, until the healing process starts up, the patient being instructed in the meantime to keep the rectum and vagina thoroughly clean with antiseptic washes, of which a five per cent solution of borax is to be preferred. If the openings are large, the sinuses is dissected out, or the margins pared away, after which the opening in each organ should be closed separately with fine chromicized catgut, first separating the walls of the recto-vaginal septum sufficiently to aid in the work.

Recto-urethral fistula, as previously stated, is rarely met with. This is fortunate, as the morbid condition is often difficult to cure. Mild cases have been known to heal spontaneous-

ly, the suppurating track closing from active inflammatory action. The author aided the healing process in a case by first divulsing the sphincter muscles, bringing the rectal opening of the fistula into view, dilating and curetting the track, after which the canal was slightly cauterized with carbolic acid, the bowels kept locked for a few days, the urine drawn with a catheter three or four times a day, following which the urethra was cleansed with a weak boric solution, as was the rectum following the first few bowel movements. The track rapidly granulated shut, and healed in two weeks. Aggravated cases may have to be slit up with the knife, curetted, and the rectal opening closed with catgut, the subsequent treatment being the same as suggested in the preceding case.

Recto-vesical fistula is often difficult to cure, especially if of long standing. To prepare the patient for the operative work the same course should be followed as suggested in the recto-urethral case. The sphincters should be thoroughly divulsed, the rectum washed out with a two per cent boric solution; curette if possible, cauterize or slit open the track, as the existing state of the case will demand. Frequent bowel movements should be prevented, and a rectal tube retained in the bowel to allow the escape of flatus. The urine should be voided through a silk catheter, which should be retained in the bladder, if possible, for a few days. If a slitting of the canal is resorted to, the rectal end of the sinus should be closed with fine chromicized catgut, the stitches reaching deeply; care being taken, however, not to extend the needle into the bladder.

Recto-labial fistula may be cured by two procedures: After the parts are rendered sterile, the fistula is laid open through into the rectum. The cut through the sphincter should be at a right angle. The suppurating track may be dissected out, or cauterized, as the operator may determine. If the sphincter-vagina be divided it can be united at a later date. Should the patient object to the cutting operation, an elastic ligature may be passed through the sinus and tied over the intervening tissues, and left to cut its way out, which it will do in a few days, the parts being kept clean during the time by antiseptic washes. In this connection the author would recommend the elastic ligature in the treatment of
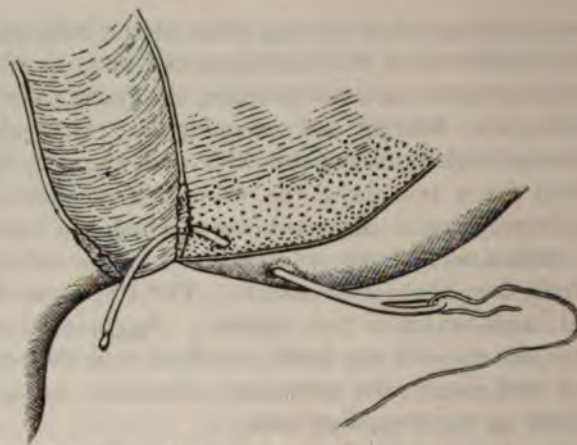
Fig. 350.—Introducing a rubber ligature through an anal fistula for a bloodless operation. (After *Howe.*)

suitable anal fistulæ, where division of the canal will not be submitted to by the patient. (See cut.)

If fecal incontinence follows division of the sphincters, which it will in some cases, relief and cure can only be expected through operative measures. Two methods are in vogue, cauterization and the plastic operation. The former is done with the Paquelin cautery, the flat point heated to a red heat, and passed through the mucous membrane and sphincter muscles,

Fig. 351.—Operation for fistula in ano, by the ligature method. *A*, first step; *B*, second step; *C*, third step. (*Gant.*)

and extending to the margin of the anus. These divisions should take place at two or three points, equidistant from each other, as the case will determine. The subsequent treatment will require the traumatic surface to be kept clean with antiseptic washes and allowed to heal. A certain amount of contraction of this part of the rectum will take place. If it should be insufficient, the process may be repeated one or more times at a later date.

The successive steps of the plastic operation to cure the morbid state of the sphincters, in cases of incontinence, is, in
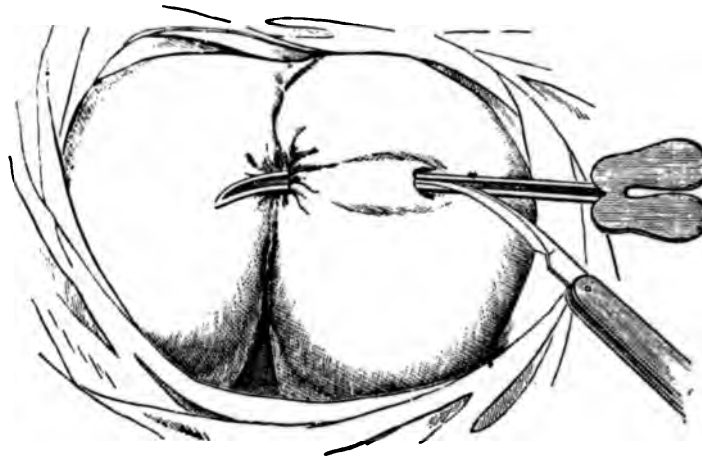
Fig. 352.—Tissues overlying a fistulous track raised on a grooved director before incising. (After *Howe*.)

great part, like that of mending a ruptured perineum. The mucous membrane is divided, the ends of the divided sphincter muscle picked up, freshened, and united with catgut sutures. If the incontinence is due to a relaxed state of the sphincter muscles, a section may be removed, together with the overlying tissues, when the ends of the muscles are to be united as in the previous case. Should the first operation prove insufficient, a second may be done at a subsequent period. In cases where either of the foregoing operations is impracticable, an inguinal colostomy should be performed, to better the patient's condition, both as regards business and social requirements.

RECTAL FEEDING

Insane persons, and others suffering from coma, delirium, and paralysis of the muscles of deglutition, and morbid states of the mouth, throat, and upper part of the digestive tract, are often tided over a sufficient period of time to allow the patient to recover, through operative and other measures of treatment, by giving sufficient nourishment by way of rectal feeding.

To insure absorption of the nutrient fluids thus administered, certain conditions must be complied with. Of the first importance, the rectal mucous membrane must be freed from feces and mucoid discharges. Of equal importance is the maintaining of the rectum in a healthy state, free from irritation and inflammation.

The proper regulation of the nutrient fluids to be administered per enemata, as regards quantity, quality and frequency of feeding, is also of such importance that this method of giving nourishment will prove futile if caution is not observed.

There are some morbid states where the stomach can receive and digest certain kinds of food in small quantities, but not enough to properly nourish the body; in such cases, feeding per rectum will sustain life and prevent emaciation.

Certain morbid conditions of the stomach that prevent the digestion of food, or the taking of drink, are followed by excessive thirst that rectal feeding can hardly satisfy. Inflammation, gastric ulcers, cancer, reflex vomiting, marked irritation caused by the taking of corrosive poisons, and extreme feebleness of the viscus, are affections of this character. Hemorrhages from the stomach nearly always provoke thirst, that rectal injections of any fluid, except weak saline solution, fail to relieve.

The method of administering fluid foods per rectum should receive some attention from the surgeon and nurse. The common practice of forcing the fluids into the rectum with hard rubber or fountain syringes often provokes serious irritation of the rectal pouch, that takes weeks to recover from. After the rectum has been put in condition to receive the nutrient fluids, a catheter of large size should be lubricated with olive oil and passed up eight or ten inches, using little force in the introduction. The catheter should be of moderate stiffness, to prevent it doubling

on itself while being introduced. A sterile Davidson syringe or granite irrigating can with sterile rubber tubing attached, may be utilized to administer the fluid enemata, after attaching the end of the tubing to the end of the previously introduced catheter or rectal tube. The syringe of choice should be a two or three ounce hard rubber instrument with a tapering tip, that will easily fit in the end of the rectal tube, but, unfortunately, such an instrument is not always available when most needed. In the use of any kind of syringe, care should be exercised not to draw air into the instrument and force it into the bowel with the nutrient fluid; to do so would excite peristalsis, that would likely cause an evacuation of the fluid nutriment.

By placing the injected fluid high in the bowel, it is more rapidly absorbed and is not so apt to be expelled. The fluid should be given slowly and the feeding should not be too frequent. The age of the patient and nature of the ailment requiring the administration of nutriment by enemata will determine the amount to be given at each feeding and the interval between them. In ordinary cases, three to four ounces may be given to adults every five or six hours, depending upon how readily the fluid is absorbed, for an injection of nutriment should not be given until the previous one has been taken up by the absorbent vessels or evacuated. Too frequent injections of even an ounce or two will soon set up a severe state of rectal irritation that sorely distresses the patient at each feeding, besides delaying or entirely preventing absorption and provoking more or less tenesmus.

Nutrient enemata should be given at about the temperature of the body, no hotter, and never cold; either extreme is apt to produce irritation or excite peristalsis. The retention of fluid nutriment in the rectum, by children and nervous persons, is very difficult, especially when thus administered for the first few times. In such cases, a folded compress should be pressed against the anus for ten to fifteen minutes after withdrawing the tube, or a longer time if necessary. It will aid materially in the administration of the nutriment and its retention, if the patient is placed upon the left side with the hips on a cushion or

pillow, retaining the recumbent position for an hour or more following the process.

At the outset, the rectum is not always tolerant of food injections, and may reject the most of them for the first few days, but by observing conditions previously alluded to, the sensitiveness of the rectum may be soon overcome. Rectal diseases, such as fissures, ulcers, and hemorrhoids often seriously interfere in the process of rectal feeding and greater care must be exercised in such cases not to intensify the existing irritability of the anus and rectum, when introducing the rectal tube and giving the enema; even then it often becomes necessary to apply locally to the sensitive parts cocaine in solution before executing the work.

It frequently occurs that a diarrhœa is provoked by the rectal irritation produced by prolonged rectal feeding; in such cases, this method of giving nourishment should be discontinued for a short time, when it can again be resumed. During the interval, the rectum should be cleansed with a warm solution of borax and salicylic acid at least once a day. This solution should contain about two drachms of borax and a half drachm of the acid to the quart of water; the strength of the mixture may be increased or diminished to meet the exigency of the case in hand. In extreme cases of irritability of the mucous membrane, attended with tenesmus and pain, a few drops of McMunn's elixir of opium may be added to the cleansing solution at the commencement of treatment. In lieu of this agent, two or three grains of heroin may be dissolved in a little hot water and added to the quart of solution; neither of these soothing agents should be continued for any length of time, the reason for which is obvious. If cleansing of the rectum is done immediately preceding the giving of the nutrient enemata, the effect of the opiate will aid materially in its retention for a longer period of time.

Of great importance to successful rectal feeding is the selection of available food substances and their proper preparation. Very few articles of food, even when carefully reduced to a fluid, will be readily absorbed from the rectal mucous membrane. Eggs, beef and milk, prepared by the various methods that ren-

der these valuable articles of food suitable for rectal alimentation, are in common use. Of these substances, milk stands first, eggs stand second in the order of nutrition and ready absorption, and the liquid beef preparation comes last. Milk containing little cream, to which is added pancreatin sufficient to start the process of digestion, usually ten to twenty grains to the ounce, and warmed to about the temperature of the body, can be given in from one to four ounces every three to six hours.

The albumen of two or three eggs is properly prepared by the addition of a few grains of pancreatin or peptogenic powder, stirring till reduced to a thin fluid and given warm, it is very readily absorbed. It can also be added to peptonized milk, markedly increasing its nourishing properties. A few grains of salt may be added to the mixture, which will often aid in its absorption.

The yolk of eggs is not easily absorbed by the rectal mucous membrane; hence, it is seldom given for enemata beaten up with the albumen or in the form of eggnog.

The various preparations of beef juice are nourishing, once it is absorbed and taken up by the circulating medium of the system. Two to four ounces of beef-tea or compressed beefjuice, to which is added five to ten drops of dilute hydrochloric acid and ten to fifteen grains of pepsin, makes a suitable portion for one feeding. It should be prepared fresh for each feeding, otherwise the mixture is apt to provoke more or less irritation of the rectum. One or two injections a day, alternated with egg albumen or milk, will be sufficient in most cases. It should always be given quite warm. Bovinine, another meat preparation, is very nourishing and quite readily absorbed. It can be given in quantities of one-half to one ounce at a time, and is best added to peptonized milk, to which a little salt may be added, if preferred.

Starchy foods, unless previously digested, are not absorbed by the rectal mucous membrane; neither are the oils and fats. The latter are very apt to excite bowel movements; besides, they coat over the surfaces of the mucous membrane, greatly interfering with the absorption of other nutrient fluids that may be administered later.

Alcoholic preparations are given by rectal injection in collapse and other emergency cases, in small quantities, and properly diluted, either with other fluid foods or with a little warm water. Good whiskey is preferred to the other preparations containing alcohol when it can be had; however, pure alcohol can be administered in small quantities, if well diluted in water, about one part to three or four of water.

HEMORRHOIDS—PILES

Hemorrhoids are vascular tumors involving the blood vessels of the submucous tissues above the anus, and are frequently complicated by an infiltrated state of the surrounding connective tissue.

The morbid state is presented in various forms and degrees of severity; thus, the external pile is observed as merely a tag of skin occurring near the anal opening, or as little vascular tumors varying in size at the muco-cutaneous junction. The latter is truly a dilated hemorrhoidal vein known as a hæmatoma.

Internal hemorrhoids present two varieties, the venous and the capillary. Owing to the frequent hemorrhages resulting from both varieties, the morbid condition is usually spoken of as bleeding piles. The venous pile is pedunculated in form, while the capillary variety is just the reverse, it usually having a much broader base.

As predisposing causes, leading up to hemorrhoidal states, may be mentioned hereditary influences, the absence of valves in the hemorrhoidal veins which complicates seriously the circulation of blood, especially so owing to the fact that mankind is most of the time in the erect posture. Among the active causes provoking piles may be mentioned the interference of the circulation in the hemorrhoidal veins by the presence of ovarian and other pelvic tumefactions, pregnancy, pronounced constipated states of the bowels, and the habitual use of alcoholic drinks. The morbid state of the hemorrhoidal veins frequently accompanies serious constitutional diseases, as pulmonary consumption, scrofula, syphilis, and aggravated dyspeptic conditions.

The common symptoms observed in hemorrhoidal states are heat, pain, and more or less tenderness. The congested state of the tissues provokes a sensation of fullness in the lower rectum and about the anus. Itching is a pronounced feature in some cases, as is bleeding in others, especially in internal piles.

Owing to the various forms of hemorrhoids, the treatment of the morbid state, of necessity, will have to take on a wide range. If the morbid condition be provoked by a constipated state of the bowel, laxatives and a regulated diet, will at once be suggested. Cooked fruit sauce with a little sweetening is allowed, especially prunes, raisins and figs. Graham and·cracked wheat bread should be eaten, instead of bread made from finely bolted flour. Vegetable salad, with mayonnaise dressing made from olive oil, or served with olive oil, lemon juice and sugar if desired, serves the purpose of a peptic and laxative in most cases. Milk served in various ways and rich soups highly seasoned, while palatable, are usually binding.

A glass of cold water, on arising in the morning, acts as a laxative with some; others may have to repeat the draught with a portion of some one of the salines, two or three times during the day, to get good results. Thirty grains of sulphur, mixed with a little sugar thrown upon the tongue and washed down with the morning glass of cold water, accomplishes the purpose in many cases. In resorting to remedial measures to regulate bowel movements, it is well known that what will help in one case will prove ineffectual in another. Drastic cathartics find no place in the treatment of piles. Small doses of aloin, strychnia, and belladonna in pill form, administered on arising in the morning and at bed time, with a few swallows of water, will prove of service in many cases of sluggish bowels, especially in elderly people. Plenty of exercise in the open air will contribute largely to any course of treatment that may be advised in a medical way.

Local applications to relieve the itching, pain, and tenderness that are so frequently a feature of hemorrhoids, have given various results: an excellent unguent for these morbid phases of the disease is composed of the following ingredients:

℞.
    Menthol Crystals .... gr. x.
    Cocaine Hydrochlorate ....,..... gr. x.
    Ext. Belladonna ....
    Ext. Veratrum Vir., āā ....gr. ij.
    Cold Cream .... ℥ j.
M. Sig.—Apply internally and externally to the hemorrhoidal
    mass three or four times a day, or as may be needed to con-
    trol the irritable symptoms.

Temporary applications of ice will prove comforting and
will give relief in inflammatory conditions, in some cases, as will
hot fomentations in others. If the pain be severe and persistent,
use a suppository composed of the following remedies:

℞.
    Ext. Hyoscyami ....
    Ext. Cannabis Indica, āā .... gr. ij.
    Codein .... gr. viij.
    Cocoa Butter, q. s. to make suppositories No. 12.
M. Sig.—Use one per rectum, as may be needed to control
    pain.

In aggravated cases, no form of medicinal treatment gives
promise of a cure, and operative measures must be resorted to.
There are several methods of operative procedure that are recog-
nized by modern surgeons, and, as the special features of each
individual case will suggest the method of procedure, the special
advantages of each method are frequently put to use. The in-
jection of small pile tumors, that are situated high up in the
rectum, with carbolic acid varying in strength from twenty per
cent to that of full strength, is still practiced by many surgeons,
but owing to the severe inflammation that the caustic frequently
sets up, followed in many instances by rectal abscesses and gan-
grene, has put this method in disrepute with the majority of
operators. The hematoma, or true external pile tumor, should
be cocainized, incised, and the clot turned out, after which the
cavity should be packed with small strips of iodoform gauze,
which should be left for two or three days; following this, the
wound should be dressed with the alkaline antiseptic. In some
instances, it is better to excise the entire tumor. This is done
under proper antiseptic precautions, and local or general anæs-
thesia; the latter is to be preferred. When all is in readiness,
seize the tumor with a dressing forcep and, while it is held ex-
tended, a submuco-cutaneous ligature of silk is made to encircle

its base. The tumor is now cut away, the incision extending beyond the encircling strand by a quarter of an inch. The ligature is now drawn tight and securely tied, and the wound dressed with antiseptic washes.

The clamp and cautery is a favorite method of dealing with hemorrhoidal states, with many eminent surgeons. The efficiency and ease of execution are features that highly commend it. Previous to executing this operative procedure, the patient being under an anæsthetic, the anal sphincter should be fully dilated. If now the tumor does not present, it should be exposed with a speculum, when it is seized with forceps and drawn down outside the anus, if possible; the mucous membrane covering the pile tumor should be divided at or near its base with a knife; the clamp is now applied in the line of this incision and in the long axis of the rectum; the blades of the clamp are now securely fastened together and the tumor cut away, after which the stump should be carefully cauterized with a Paquelin cautery; this done, loosen the clamp slightly, and if hemorrhage follows, the clamp should be again tightened and the stump more thoroughly charred with the cautery. Following this procedure, the patient should be put to bed and quietude enjoined. The diet should be light and fluid in kind.

In aggravated cases, where the pile-bearing area is extensively diseased, little good can be promised, except that the pile-bearing tract be entirely dissected away. This procedure is what is known as Whitehead's method, for the technic of which the reader is referred to special treatises along this line of work.

ANAL FISSURE

As a result of traumatism from mechanical injures, or the forced passages of large hard masses of fecal matter, a tear or crack in the mucous membrane takes place just within the verge of the anus, which soon becomes extremely irritable and painful, and later through pathological changes assumes ulcerative states. Excepting cancer, fissure is the most painful of all anal troubles, and in many cases through sympathetic action the morbid state is responsible for severe attacks of cystitis, and in the

female, utero-ovarian affections frequently result from the same cause.

To examine a patient for anal fissure is to subject him to a painful ordeal, unless the work is done under anæsthesia, local or general.

The diagnostic symptoms of the morbid condition, are smarting pain after defecation, often intense and radiating in character, followed by an aching in the rectum which may last for some hours. Feces streaked with blood is also a common symptom of the morbid state, as is a seepage of mucus from the anus. When the morbid state accompanies a constitutional taint, little can be done of a local character to effect a cure without the aid of systemic treatment.

Treatment Little benefit can be derived from the application of lotions, salves, and suppositories except as palliative measures, and these agents should be prescribed only when radical measures are refused. A suppository composed of the following ingredients introduced into the rectum every four to six hours will relieve all irritation and keep the patient comfortable:

℞.
    Oil of Thuja .... ℨ j
    Ext. Cannabis Indica ....
    Ext. of Hyoscyami āā............................... gr. ij
    Codeine .... gr. viij
    Cocoa Butter, q. s. to make suppositories No. 12.
  M. Sig.—Use as above directed.

If an unguent is preferred to the suppositories by either the surgeon or the patient the following mixture will be found efficient;

℞.
    Oil of Thuja .... ℨ j
    Menthol .... gr. v
    Cocaine .... gr. x
    Cold Cream .... ℨ j
  M. Sig.—Smear within the anal folds three or four times a
    day, especially after defecation.

To lessen the possibility of further injury to the abraded mucous membrane by the passage of hard fecal matter, and to aid in the easy expulsion of the same, rectal enemas of olive oil and glycerine, one half ounce of the latter to three onces of the former, given comfortably warm just previous to defecation, is

commended. The majority of cases of long standing will not yield to other treatment than that obtained through operative measures, the most commendable of which is divulsion; this is accomplished with the thumbs of the operator, or with the rectal speculum, the patient being first thoroughly anæsthetized, Where the floor of the crack or ulcer is thickened and indurated, good results are obtained from freely scarifying the ulcerated area, or curetting the same with a sharp curette. If divulsion of the sphincter muscle is resorted to for relief of the morbid state, it must be thoroughly done that the spasm or grip may be entirely overcome. Following any operative measures the function of the bowel and rectum should be regulated by broken doses of the alkaline laxatives with a small portion of sulphur added to the morning dose.

The diet should be composed of rice, custards, soft boiled eggs, graham bread, crackers, mush and apple and prune sauce. Following any operative procedure the patient should keep his bed for several days.

FECAL FISTULA

The surgeon is frequently consulted with regard to unnatural communications between the bowel and the skin surface of the abdominal wall or some one of the hollow organs adjacent to the intestines, such as the bladder, uterus and vagina.

The common causes of fecal fistulæ are necrotic disease, and the refusal of the wound to heal after operations on the intestine. Frequently a fistulous track is purposely created in the bowel to relieve painful and distressed states of the intestine in malignant disease or other forms of occlusion of the latter. It is a serious condition to meet with when the fecal opening is in the bladder or abdominal cavity, operative measures being demanded at once to relieve the serious situation in the former case and save life in the latter. Fecal matter escaping from the rectum or lower part of the colon into the pelvis through a fistulous opening may, with safety to the patient, be drained through an opening in Douglass' cul-de-sac down through the

vagina, the fistula closing within a reasonable time unless it is malignant in character.

Fistulous openings in the intestines in the right inguinal region resulting from appendicitis or following operative measures adopted for relief of the same, are by no means uncommon and require opening up the abscess cavity and draining off the purulent fluid that soon collects in and about the **capit coli,** cleansing the cavity with hot sterile saline solution, and establishing drainage. In time the opening in the bowel will close; in fact fistulæ of this character heal more readily than do the variety that are occasionally observed where the bowel becomes adhered to the wall of the abdomen, the fistula opening upon the surface, leaving a mucous-lined open sore. Fistulous tracks tortuous in character extending through the tissues of the abdominal wall occasionally heal spontaneously in individuals having excellent health and great resisting power, but such is not the rule as the suppurating track is surrounded with tough fibrous tissue which is not favorably given to originating granulations and other reparative material that is necessary to close the fistulous opening.

The symptoms of fecal fistula will vary according to the location of the bowel perforation; there will be a discharge of fecal matter in greater or less quantities, the other symptoms depending upon whether the bowel opening is **internally** or **externally** upon the skin surface, and whether the perforation is in the small intestine of the colon. Malnutrition soon follows the involvement of the small intestines, especially if the opening be large, which is not the case when the large intestine is perforated. Symptoms of peritonitis soon supervene if the bowel contents escapes into the abdominal cavity and tenderness and functional wrongs follow the escape of the fecal matter into the gall-bladder, urinary bladder, or uterus. Redness and excoriation of the skin surrounding the **external** opening of a fistula are the common symptoms noted.

Treatment. The object to be obtained in the treatment of fecal fistula is the closure of the abnormal opening, by stimulating granulations along the entire length of the suppurating track by the application of pure carbolic acid on a cotton swab once every second or third day, until three or four applications

have been made. This form of treatment will prove very efficient in some cases, especially where the fistulous track is short and small in size, or by operative procedures in cases where the use of the caustic is not feasible. In many instances it will be necessary to open the abdomen and dissect the bowel free from the abdominal wall, then removing the fistulous opening by excising a longitudinal portion from the bowel, afterward closing the rent with iron-dyed silk, the bowel replaced within the abdomen. Before closing the abdomen the fistulous track should be examined and either treated by caustics or its fibrous lining dissected out and closed as far as possible with catgut. The abdominal incision should then be closed in the usual way. All external fistulæ may be so situated as to be amenable to this form of treatment. The features of the individual case will generally suggest the form of treatment to adopt.

The treatment of recto-vaginal, recto-vesical, and recto-labial fistula is somewhat fully described under separate heads in this volume to which the reader is referred; the technic will not be given here.

PART TWENTY-FIVE

Dislocations

The term dislocation has reference to the forcible displacement of the articular surfaces of a joint. Forcibly displacing a single osseous body, like the patella and hyoid bone from its normal position is also considered a dislocation or luxation.

The common cause of the separation of articular surfaces is violent force displayed against the parts involved which may be so severe in character that a fracture may be produced and a laceration of the overlying soft structures occur as complications.

Luxations are of frequent occurrence, especially among individuals engaged in hazardous occupations, and will, without exception, result in lasting deformity if not properly reduced, to successfully accomplish which the surgeon must fully understand the anatomical relationship existing between the bones of the body and their relationship to each other and to important adjacent structures, otherwise the force displayed during the manipulation of the injured parts may inflict irreparable damage.

Dislocations may result from strenuous muscular action displayed upon the long bones where, from deficient development, the joints are imperfect and the ligaments about the articulations abnormally lax; the latter condition not infrequently follows paralysis and marked physical weakness.

Dislocations are divided into partial and complete; simple, compound and complicated. A partial luxation is one where the articular surfaces of a joint are, in most part, in contact; a complete dislocation is one where the joint surfaces merely form a contact by a small margin; a simple luxation is one that does not communicate with the exterior air, while a compound dislocation does through a laceration of the overlying soft parts. The severe injury to important nerves and vascular structures renders the injury a complicated one.

A luxation seen before inflammation supervenes is denominated **recent,** while an injury of this character that has been running for some time and has gone through the several phases following that of inflammation is spoken of as an **old** or **ancient** dislocation.

The treatment of this class of injuries will be given under the head of dislocation of special joints, which see:

DISLOCATION OF SPECIAL JOINTS

Clavicle

Considering the firm ligamentous connections of both ends of the clavicle with their respective contiguous structures, we would be led to suppose that luxation of this bone would seldom take place. It is, however, of frequent occurrence with the laboring classes.

The acromial end of the clavicle may be dislocated upward: upward and outward, even to overlapping the acromion process of the scapula, and downward; the sternal end of the clavicle may be displaced forward, the most common luxation of the bone; backward and upward. Cases have been observed where both ends of the bone have suffered dislocation at the same time.

Dislocation of the acromial end of the clavicle is generally the result of direct force applied to the clavicle or to the acromion process of the scapula. In this form of displacement, the end of the bone is felt above the acromion process in the upward dislocation, with a dropping of the shoulder and a marked disuse of the arm. The end of the bone is found between the acromion and coracoid processes of the scapula in the downward dislocation, presenting a marked prominence about the acromion process, the end of the clavicle being felt beneath this projection. There is a limited degree of motion of the arm present in all cases. A dislocation of the end of the clavicle upward and outward, subcoracoid, is of rare occurrence, and is usually caused by forcing the shoulder upward and backward. There is an unusual prominence in the region of the acromion and coracoid processess attended with pain and a restricted

use of the arm. A comparison by measurement with the opposite shoulder will often aid materially in obtaining a correct diagnosis.

Treatment: The reduction of the acromial end of the clavicle in the three different forms of dislocation, is accomplished by forcing the humerus in various directions, upward, outward, and backward, while the end of the clavicle is manipulated and forced into its normal position. It is often much easier to reduce the luxation, than it is to maintain the reduction after it is accomplished. A satisfactory method of procedure after the reduction has taken place, is to place a suitable compress over the end of the clavicle, and an absorbent cotton pad in the axilla; the pad will serve to steady the shoulder after the other dressings are applied and prevent excoriation. The most suitable dressing to firmly fix the end of the bone in its normal position, is the application of a strip of zinc oxide plaster, snugly adjusted over the shoulder and compress, commencing well in front of the chest to apply the plaster strip. The adhesive strip, about three inches wide, extends down the back of the arm and under the flexed elbow and up in front of the arm and across the shoulder and part way down the back of the chest. To give additional security, the fore-arm can be placed in a sling, and in the case of children it can be made fast to the side of the body by strips of adhesive plaster. In cases where there is a disposition to redislocation of the bone, wiring the end of the bone in place has given good results. The adhesive plaster should be kept in place three or four weeks and the arm carried in a sling a week or two longer, being governed, of course, by the progress made in the recovery.

In reducing luxation of the sternal end of the clavicle, the patient should be seated upon a low stool or chair, an assistant should grasp the shoulders and by placing his knee between the patient's shoulder-blades, he slowly, but forcibly draws them backward, while the surgeon, through well directed manipulations, forces the end of the bone into position. During these manipulations the surgeon, to aid him in replacing the end of the bone, may have to forcibly extend the arm in different posi-

tions, especially will this be likely in reducing a dislocation of the end of the clavicle upward, requiring the arm to be drawn upward and outward, while the head of the clavicle is pressed downward into its normal position. Once the luxation is reduced, a compress is adjusted over the head of the bone, and firmly held in place, by properly applied adhesive strips, the arm fixed to the side with a few turns of a cotton bandage or placed in a sling, which can then be fastened to the clothing with a safety-pin. These adjustment dressings should be worn six to eight weeks, or until the joint becomes firmly fixed with inflammatory adhesions. A common and satisfactory fixation dressing in most of these luxations of the clavicle, is the figure-of-eight bandage, applied posteriorly, the same covering the compress first applied over the injured joint.

The prognosis is generally favorable, although a lump of callus may exist for some months or even years, at the site of the injury, yet the use of the limb is generally very satisfactory.

When both ends of the clavicle are dislocated simultaneously, which occasionally takes place by falls upon the shoulder forcing it inward, the same methods obtain in the reduction and fixation as were advised in treating the luxations separately. The dressings should be retained for six or eight weeks, or until the joints become strong by the adhesions, following the inflammatory action.

Sternum

Dislocation of the several parts of the manubrium from one another is not a common injury, yet it occasionally occurs as the result of direct and indirect violence. Cases of this injury have been reported as the result of muscular action during the throes of spasm in a case of tetanus.

The large majority of cases of this injury occur in childhood and in early adult life, as after the age of forty years, fracture is likely to follow the applied force on account of the complete ossification of the segments of the bone.

The physical signs usually observed in dislocation of one or more segments of the sternum are deformity, disturbance of respiration and circulation. The prognosis is unfavorable in

grave cases, as the majority of patients receiving this injury have died, either as the result of the dislocation or from the shock received at the time of the luxation.

Treatment: In attempts at reduction, the patient should be placed upon a table, with the head and shoulders projecting over the end, when the head and neck should be drawn backward, while the surgeon makes pressure upon the projecting part in efforts to restore it to its normal position. In grave cases, an incision may be made over the seat of the injury and the use of an elevator applied to pry the ends of the luxated bone into apposition; this accomplished, the chest walls should be supported by applying strips of adhesive plaster or a bandage around the chest as adjusted in the treatment of fractured ribs.

Vertebra

Dislocation of the vertabræ is of rare occurrence, not but what the spinal column is frequently subjected to great violence, sufficient to cause luxation of its segments, but owing to the intricate articulation existing between these bodies, luxation seldom takes place from accidental causes, except the injury be complicated from a fracture of the bone.

In a recent injury to the spinal column, where a luxation is suspected, it will often tax the diagnostic acumen of the surgeon to determine this form of injury from that of fracture, by any and all physical signs and symptoms that may be present. In the dorsal and lumbar regions, a dislocation of a vertebra is always complicated with fracture, unless the injury results from a necrotic state of one or more of the bodies of the vertebral column.

Luxation of the vertebra is the result of direct violence, as from a blow or kick; or indirect violence from a fall upon the head or buttocks, and from extreme overflexion of the spinal column from any cause.

The gravity of an injury of this nature is in proportion to the injury inflicted to the spinal nerves and cord, and to determine this early, is of the utmost importance, as upon correct diagnosis the method of treatment will be determined.

The symptoms observed in dislocation of the vertebræ are not unlike those attending a fracture of a segment of the spinal column, except that in a dislocation, there is less mobility obtained on account of the spasm of muscles about the seat of the injury, and the absence of crepitus, that it is possible to elicit when a fracture has taken place. The symptoms that are common to both forms of injury, are acute pain, tenderness, and deformity.

Dislocation of the cervical vertebræ can be very readily determined by manipulation and palpation through the mouth; the head is usually turned to the opposite side when the displacement is unilateral, and bent forward when the injury is bilateral. If the cord is seriously compressed by the displaced bodies of the vertebræ, paralysis, more or less pronounced, will follow immediately. The function of the bladder and intestines is frequently interfered with in a marked degree, retention, followed by incontinence of urine and feces. Cystitis frequently develops, as a later symptom, as do excoriations and bed-sores.

Treatment: In efforts at reducing dislocations of the vertebræ, great care should be exercised, lest great injury be inflicted to the cord, and in grave cases the liability of producing sudden death. Extension and counter-extension, with moderate rotation, while the patient is under the influence of chloroform will aid materially in replacing the luxated body, especially if the injury be in the cervical region. If the injury be to the dorsal or lumbar vertebræ, and most likely complicated with a fracture of the bony segment, much benefit results from restraining the patient in the recumbent position with a permanent extension, for a reasonable time, followed by the adjustment of a plaster-of-Paris jacket, which should be worn for weeks or even months, to give support to the crippled and weakened spine.

The function of the bladder and intestines must be given attention from the first, and if cystitis develops, the bladder should be washed out once or twice a day with some mild antiseptic solution. If the patient survives, the return of motion and sensation will be gradual.

Lower Jaw

Owing to the greatly exposed situation of the inferior maxillary, the bone is prone to frequent injury. From tabulated statistics, luxation of the lower jaw constitutes about six per cent of all dislocations.

The displacement may be bilateral or unilateral, although the former is by far the most common of the injury. The accident occurs more frequently in women than in men, and is seldom observed in children and in advanced life, except it be due to grave accidental causes.

The usual displacement of the inferior maxillary is forward and backward, although cases of this injury are occasionally observed where the condyles are displaced upward and outward, both positions being due to crushing injuries. The common cause of the dislocation forward are direct force, forcibly opening the mouth, as in yawning, vomiting and the extraction of teeth, and in taking impressions in dental plaster for artificial teeth. The masseter and internal pterygoid muscles are prone to pull the jaw forward in cases where there is marked laxity of the ligamentous structures about the articulations.

Backward luxation of the jaw-bone, can not take place without a fracture of the osseous structure forming the posterior segment of the joint, hence this form of displacement is due to great violence received upon the chin in front, forcing the bone backward.

The physical signs and symptoms of the forward dislocation of the jaw-bone, are pain, swelling, more or less depression at the site of the articulation, with a little fullness anterior to the articulation, immobility, projection of the chin, and inability to close the mouth, which condition is usually attended with a free flow of saliva.

In cases of unilateral dislocation of the lower jaw, the bone inclines toward the opposite side from the injury, the reverse is the case in fracture. There is a marked fullness over the luxated articulation, attended with pain, and inability to open and close the mouth.

In dislocation of the jaw backward, the symptoms are graver in character, one or both condyles may be driven back-

ward into the external auditory canal, causing acute pain, hemorrhage from the ear, immobility, the mouth being held partly open, with a dribbling of saliva.

Treatment: Briefly stated, a reduction of a forward dislocation of the inferior maxillary is executed as follows: Insert the thumbs into the mouth until they rest upon the molar teeth, now place the middle fingers under the chin; make strong downward pressure with the thumbs, and at the same time elevate the chin with the fingers. Unless the muscles are in a rigid state of spasm, this procedure will disengage the displaced condyles and they will readily return to their normal position. As a precautionary measure, the thumbs may be wrapped with a strip of muslin to prevent them being bitten when the jaw bone snaps back into place.

Chronic or old dislocations may require excision of the condyles or the breaking down of inflammatory adhesions, before anything like an adjustment of the bone can be accomplished. After reduction, the patient should keep the mouth closed by the application of a bandage, for a week or two, and the food should be taken in fluid form. Fracture and other possible complications must be managed as they happen to present, following the dislocation. Cases of recurring luxation usually require the constant wearing of some form of bandage to keep the mouth closed.

Coccyx

The coccyx may be displaced forward, backward and laterally; however, the forward dislocation is by far the most frequently met with, the backward dislocation stands next in order of frequency of occurrence, while the lateral displacement is rarely observed. The injury is observed oftener among women than men.

The forward dislocation of the bone may result from a kick, a blow or a fall astride of some ridge-like obstacle; the backward dislocation is usually due to child-birth or hard stools in severe constipation. The lateral displacement is due to a fall upon some moderately sharp object like the edge of a board, or bar.

Severe pain in the coccygeal region is a marked symptom of the displacement of this bone, but it is not alone a diagnostic feature of the injury, as it is severe and usually attends grave nervous disturbances of the coccyx. With the patient under the influence of chloroform, a luxation may be determined by introducing the finger into the rectum and grasping the slender bone between the thumb and finger, when greater mobility can be obtained than under normal conditions. With the finger hooked over the end of the displaced bone, it can be quite readily reduced, when immediate relief from the agonizing pain and nervous symptoms is obtained.

In the forward dislocation of the coccyx, there is a marked tendency to reoccurrence, following the adjustment of the bone, owing largely to the contraction of the levator ani muscles. To overcome this, much benefit is derived from the use of a self retaining rubber dilator in the rectum.

Scapula

A dislocation of the scapula is of rare occurrence, although the accident is occasionally observed, as a result of falls upon the point of the shoulder, and crushing injuries received in the region of the bone.

The symptomatic indications of the displacement of the scapula, downward, the most common dislocation, are the overlapping of the acromion by the end of the clavicle, severe pain, a drooping of the shoulder, and a marked limit of movement of the arm. In crushing injuries, causing the luxation, the above symptoms will all be intensified, together with a laceration of the ligaments and other muscular structures covering the joint.

Treatment: In attempts at reduction, the patient should be anæsthetized, when the surgeon should forcibly draw the shoulder backward and upward, while at the same time the clavicle should be pushed back into place. Thus the luxation is easy to reduce; but it is quite likely to recur unless the joint be supported by some form of retaining dressing, the best of which is, perhaps, strapping the injured parts with strips of adhesive plaster, extending from in front of the chest over the point of the shoulder down the posterior part of the arm, through under the flexed elbow and up along the anterior

part of the arm, and up across the back of the neck, and snugly fastened. Previous to adjusting the long adhesive strip, a small compress should be placed over the point of the shoulder, and a small pad adjusted in the axilla to act, in a measure, as a fulcrum and as a support to the shoulder. Other strips of adhesive plaster may be applied to the back and across the shoulder to the opposite side of the neck, to advantage. The patient should rest quietly upon the back for a week or two, and the fore-arm should be supported in a sling.

Hyoid Bone

This injury is seldom met with, except as the result of direct force, applied to the bone, as in the act of "choking" or receiving a severe blow to the bone by the fist or other body.

The symptoms following this injury are acute pain, dysphagia, dyspnea, and more or less swelling.

To replace the bone, the head should be extended and forced backward and securely held by an assistant, while the bone is forced back into position by manipulation. The after-treatment consists in applying strips of adhesive plaster an inch wide and six to eight inches long, extending from the ear on one side of the neck, across in front and made fast to the opposite side of the neck and back of the shoulder; the next strip is adjusted in like manner, but to the opposite side of the neck. These strips of plaster should be worn for two or three weeks, or until the injured parts have fully recovered. Owing to the gravity of the injury in many cases, the prognosis should be guarded.

DISLOCATION OF THE RIBS

It is claimed by some surgeons that a dislocation of the ribs may occur at either end, however, owing to the fact that the sternal ends of the ribs do not properly articulate with that bone, but with a reinforcement of cartilaginous structure, a separation from which really constitutes a fracture and should be treated as such.

The articulation of the vertebral extremities of the ribs is somewhat complex, connecting as they do with the bodies of

the vertebræ and with the transverse processes of these bodies to which the rib is firmly secured by ligamentous attachment. As this accident is mainly due to direct force, as from kicks, blows and falls, it is not uncommon to determine that a fracture of the rib or the transverse process has resulted from the same cause. It is difficult to determine a dislocation from a fracture, occurring near the end of the rib, by symptoms usually presenting, which are about the same in both accidents, except it be possible to elicit crepitus, and even should this be obtained, both condition may exist, one as a complication to the other. The prominent symptoms attending both fracture and dislocation of the ribs are depressed over the seat of the injury, abnormal mobility, and pain, which becomes excruciating during respiration.

Treatment: About the only method of treatment that has given satisfaction in dislocation of the ribs, is the adjustment of a suitable compress over the luxation, followed by strapping the chest with long strips of zinc oxide plaster, which will act as a support to the ribs and restrain costal respiration. In lieu of the adhesive plaster, the chest may be compressed with a strip of muslin or towel, which will accomplish the same end. The prognosis should be guarded, as a force that is keen enough to produce a dislocation is likely to inflict dangerous internal injuries.

DISLOCATION OF THE HUMERUS

Owing to the great exposure of the arm to violence in the various vocations of life, the dislocation of the shoulder occurs about as frequently as all the other luxations combined. The accident occurs more frequently in men than in women and is frequent in early and middle adult life, infrequent in early childhood and rare in old age. The peculiar features of the joint, composed, as it is, of a shallow socket, in which plays the head of the humerus, situated at the exposed point of the scapula, supported by ligaments, none too powerful, the length of the arm serving as a leverage, all contribute to the frequent displacement of the bone.

The common displacements of the head of the humerus are the subcoracoid, subglenoid, and post-glenoid or subspinous; and the relative frequency of the accident is in the order named. The characteristic symptoms of the subcoracoid luxation are the limit of. motion of the arm, the presence of the head of the humerus in the upper and anterior part of the axilla, the natural contour of the apex of the shoulder is changed as noted, comparing it with the other shoulder; the humerus is held obliquely from the side, and there is a tingling and numbness experienced in the forearm and hand, caused by the head of
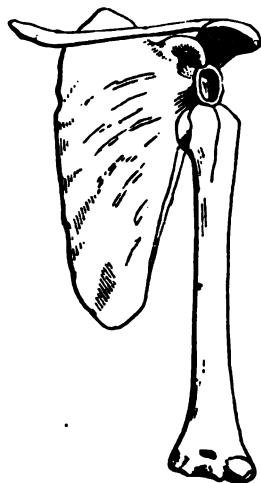
Fig. 353.—Subglenoid dislocation of the humerus. (*Howe.*)

the humerus pressing upon the axillary plexus of the nerves. The length of the arm as compared with the opposite limb, will depend upon the distance that the head of the humerus rests from the glenoid cavity.

In the subglenoid luxation, the length of the arm is increased from an inch and a half to two inches, or the width of the glenoid cavity. There is a marked depression felt below the acromion process, the arm is held away from the body, and there is a limit of motion.

The physical signs of the subspinous form of the injury, are the fullness observed on the back of the scapula near the glenoid fossa, caused by the presence of the head of the humerus;

a noted prominence of the coracoid process and the position
which the arm assumes, which is thrown across the chest, neces-
sitating the elbow forced farther forward than in either of the
other displacements.

Fig. 354.—Dislocation of the humerus backward, beneath
the spine of the scapula.

The cause leading up to a dislocation of the humerus are
falls upon the arm and hand, or shoulder; heavy blows directed
upon the point of the shoulder; and forcibly extending the arm
from the body.

Treatment: To successfully reduce the luxations of the
humerus by manipulation is very easily accomplished, especially
if the patient is under the influence of chloroform. One method
of procedure is to place the patient upon a bed or couch when
the surgeon takes a seat beside him; the arm is grasped at the
wrist and elbow and forcibly elevated and extended from the
side, with the heel (boot removed) now pressed firmly in the
axilla against the head of the humerus, the arm is quickly
brought down to the side and partly across the chest over the
surgeon's heel, which acts as a fulcrum, when the head of the
bone is made to snap back into place. If the muscular rigidity be
not pronounced, the head of the humerus may be replaced with
the thumb while the arm is made to assume favorable positions
during the manipulation.

Kocher's method of reducing the subcoracoid displacement
of the humerus is as follows: With the forearm flexed at
right angles with the humerus, grasp the wrist and elbow, ro-

tating the forearm outward, keeping the elbow close to the side of the body. Still holding the forearm rotated outward, place the lower end of the humerus inward and across the body as far as possible, when the forearm is quickly rotated inward and the whole limb extended, the elbow during these manipulations must be kept close to the body, as is shown in the accompanying figures.

Fig. 355.—*Kocher's* method of reducing dislocation of the shoulder. *A,* first movement, outward rotation; *B,* second movement, elevation of the elbow; *C,* third movement, inward rotation and lowering of the elbow. (*Griffith.*)

In efforts at reduction of the subspinous dislocation of the humerus, the patient should be seated on a stool or low chair, the surgeon grasping the arm at the elbow and carrying it forcibly across the front of the chest; now with the thumb of the other hand make downward pressure upon the head of the humerus, aided by the fingers being hooked in the axilla, forcing it into position as the patient's arm is quickly swung backward. One point should always be kept in mind when making attempts at replacing a dislocation of the humerus or femur by any one of the recognized methods of procedure; if the head of the shaft of either has escaped from the cavity of the joint through a rent in the capsular ligament it must be returned through the same tear, whether it be accomplished by mechanical extension or by manipulation.

Should the luxation of the humerus be complicated with a fracture near the end of the shaft, the surgeon will exercise good judgment if he makes an effort to replace the head by manipulation before adjusting the fracture; if this be impossible an effort should be made to unite the fractured ends of the shaft of the humerus with appropriate splints or other dressings, ap-

plied in such a manner as to give support to the injured limb for six or eight weeks when an effort should be made to break up the adhesions that may exist and replace the head to its normal position.

The after treatment following dislocation of the humerus consists in wearing a suitable pad in the axilla, and slinging the arm to the side of the body for ten days to two weeks, when passive motion should be made several times a day until the normal use of the limb has been secured. Do not attempt reduction in cases of three or four months standing, if the patient has a fair use of the arm.

DISLOCATION OF THE ELBOW

In dislocation of the elbow joint, the radius and ulna may be displaced backward, the common luxation; forward, and laterally. The radius may be displaced forward, backward, and outward. The ulna is usually displaced backward. The backward dislocation of both bones is usually caused by a heavy fall upon the palm of the hand, however, a sharp blow received on the

Fig. 356.—Dislocation of the elbow backwards. (*Howe.*)

posterior aspect of the humerus, near the elbow joint is likely to force the lower end of the shaft forward upon the radius and ulna. The characteristic symptoms of this luxation are deformity, immobility caused by rigidity of muscles about the joint; a marked prominence at posterior part of the joint, caused by the projection backward of the olecranon; the arm assumes a semi-flexed state with the forearm and hand more or less pronated. The fingers are more or less flexed, there is a tingling numbness experienced in the extremity of the limb, caused by nerve pressure at the seat of injury. If some time has elapsed before the injury is observed, the great amount of swelling that is present may make the diognosis between a fracture and luxation, somewhat difficult to determine. A valuable point to remember here is that in displacement there is marked rigidity of muscles, while in fracture there is mobility at the seat of injury and in the majority of cases, crepitus can be elicited.

A displacement of the radius and ulna forward is of rare occurrence and seemingly can not occur without fracturing the olecranon process; but that cases have been observed without fracture is a matter of statistical record. It is caused by forced outward flexion, with extreme twisting of the limb. The prominent symptoms present are a flexion of the arm nearly to a right angle, the forearm increased in length, a marked prominence of the condyles, and rigidity of the joint.

There are two forms of the lateral displacement of the radius and ulna, the outward and the inward luxation. The outward dislocation is the most frequently met with and is quite readily determined by the peculiar displacement of the end of the bones. The end of the ulna usually rests near the place that the head of the radius usually occupies, while the head of the radius is located far in front of its usual location, and of course, does not approach the articular surface of the humerus. There is a marked widening of the joint, the forearm is flexed and usually pronated.

In the inward luxation, the head of the radius usually rests near or in the trochlea, while the olecranon rests above and internally to its normal position. In all forms of displacement of the elbow, resulting from whatever cause, there is more or

less injury to the muscles and ligaments surrounding the joint, which often complicates any method of treatment.

Treatment: The common method adopted by most surgeons in reducing a luxation of both bones backward, is to place the patient on a stool or chair, then grasp the wrist and forearm, make what extension is possible and with the knee placed near the seat of the injury, slowly and forcibly flex the arm and at the same time press the knee against the inner side of the elbow to disengage the ends of the radius and ulna from the lower end of the humerus; during this procedure it may be necessary to rotate the forearm to aid in replacing the bones to their normal state.

If the surgeon be able to exert pressure sufficient with the hand against the upper end of the radius and ulna, while he makes extension and rotation with the other, he may be able to replace the bones without using the knee as a fulcrum; this is possible if the patient be under the influence of an anæsthetic.

The reduction of the lateral dislocations is accomplished by making extension and rotation, while the patient is under chloroform, while an assistant steadies the shoulder and at the same time makes counter extension. Any difficulty experienced in dislodging the ends of the radius and ulna, may be overcome by forceful manipulation with one hand while extension and rotation are being made with the other.

After reduction of dislocations at the elbow, the forearm should be placed in a sling, and topical application made to the joint of cooling and anodyne lotions to subdue pain and inflammatory action. Much difficulty is experienced ofttimes, in reducing luxations at the elbow of some weeks standing, owing largely to the inflammatory deposits in and about the articular surfaces.

To reduce the anterior dislocation of the head of the radius, the forearm should be well flexed, and while an assistant makes counter extension, the surgeon makes extension and forced pronation and with the thumb of the other hand, he presses the head of the bone into place.

In the backward displacement of the head of the radius, reduction is accomplished by making extension and counter ex-

tension on the forearm, while it is flexed at the elbow; then
by force, supination and direct pressure against the head of
the bone, it is made to assume its normal position. Any vari-
ation of the different forms of displacement of the elbow joint
mentioned above will have to be adjusted as the best judg-
ment and the experience of the surgeon will determine. As to
the adjustment of the ulna backwards, the same procedure is
made use of to reduce the luxation, as was employed in the re-
duction of both bones backward.

DISLOCATION OF THE WRIST

There are, in reality, but two distinct and uncomplicated
forms of dislocation of the wrist; a displacement of the carpus
backward upon the lower end of the radius and ulna, and for-
ward, where the bones rest upon the anterior aspect of the
distal ends of the bones of the forearm. Any variation of
these displacements is usually complicated with a fracture of
the lower end of the radius. The characteristic symptom of
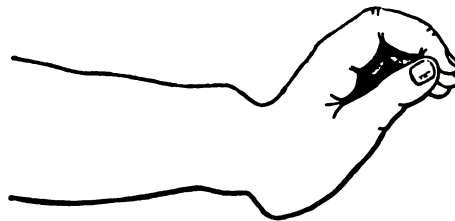
Fig. 357.—Dislocation of the wrist forward.

the former luxation, is deformity, caused by a marked projec-
tion of the lower end of the ulna on the posterior part of the
carpus; the hand is more or less pronated, with a depression on
the anterior aspect of the wrist. The hand is not held as rig-
idly as the nature of the injury would be supposed to provoke,
but supination is difficult. There is tensive pain and more or
less tumefaction about the joint.

Extreme pronation of the hand and wrist, resulting from
falls upon the back of the hand, or from a forced twisting of the
wrist, is the common cause of this injury.

Treatment: To reduce this form of displacement of the wrist, the patient should be placed under the influence of an anæsthetic to lessen pain and relax the muscular tension. The surgeon then grasps the hand and while making flexion, he forcibly extends the wrist; during this procedure he uses the thumb of the other hand as a fulcrum and presses the luxated carpus forward into place, which it assumes with an audible snap. In extreme muscular rigidity, the first effort at reduction may not prove successful, but repeated efforts along the line of procedure spoken of usually succeed in the end.

In the forward dislocation of the carpus, which is somewhat rare, there is pain, numbness in the fingers, and marked deformity, caused by the projection of the lower end of the radius and ulna backward and the carpus presenting abnormally forward. The displacement is usually the result of heavy falls upon the hand, forcing it backward upon the forearm.

To reduce this displacement, the hand should be forced still more in extreme extension, with the thumb pressing hard against the end of the carpus, the patient's hand is seized and forcibly extended, while an assistant makes counter extension, when proper manipulation will snap the bones into place. Following reduction of the carpal bones, the forearm and hand should be supported for a week or two on a splint or in a plaster cast, after which passive motion should be exercised once or twice a day until a normal use of the limb is obtained. In cases where the ligaments have been lacerated and the soft structures about the joint more or less bruised, the after dressing should consist of the frequent application of cooling and anodyne lotions, composed of witch-hazel and tincture of opium, of each two ounces to a pint of water; or one ounce of muriate of ammonia dissolved in two quarts of water.

Any variation of the two forms of displacement above mentioned can usually be adjusted by extending and rotating the hand while the displaced fragments are pressed into position, the patient being under an anæsthetic to overcome rigidity and pain.

DISLOCATION OF THE METACARPAL BONES

A dislocation of the metarcarpal bones occurs only as a result of a fall upon the thumb, and crushing forces applied to the hand as frequently occurs from having the hand caught in a pulley or belting, and from explosive forces. The most common of these injuries is the backward displacement of the metacarpal bone of the thumb; although a forward luxation of this bone is possible, it is not observed as frequently as is the former injury.

The symptoms of the backward displacement of the metacarpal bone of the thumb as is usually seen, are a dorsal prominence of the base of the metacarpal bone, with a shortening of the thumb; there is limit of the movements of the thumb, with a flexure at the carpo-metacarpal articulation. The trapezium is recognized as a lump in the palmar aspect of the thumb.

Treatment: To effect reduction of this luxation, the patient should be placed under chloroform, when traction should be made on the thumb with something of a rocking movement, while with the surgeon's thumb, direct pressure is made against the base of the displaced bone, slipping it into place. To replace the forward dislocation, traction should be made on the thumb while the base of the metacarpal bone is pressed back into its normal position. The replacement of the metacarpal bones of the fingers is accomplished by making extension upon the fingers, while the ends of the luxated bones are pressed into their natural position. As severe injury to the soft parts often ensues topical application of cooling lotions can be made to the bruised and painful parts to a good purpose in controlling pain and inflammatory action.

DISLOCATION OF THE PHALANGES

Dislocation of the phalanges, especially of the little finger and thumb, is of frequent occurrence, and is usually the result of a fall or blow upon the end of the digits. It has been ascertained from statistical records that about twenty-five per cent

of all dislocations are confined to the phalanges of the hand, and the displacement of the metacarpo-phalangeal articulation of the thumb is the most frequently met with of all other dislocations.

Fig. 358.—Dislocation of the first phalanx of the thumb forward. (*Howe.*)

Owing to the character of the phalangeal articulations, it is possible for the displacement of the end of the bones to take place backward, forward and laterally; the former is the most common injury and may be complete or only partly luxated.

The symptoms of luxation of the phalangeal joints are deformity, pain and inability to move the digit. If the displacement is not adjusted soon after its reception, the great amount of swelling may make a correct diagnosis somewhat doubtful, especially in the incomplete forms.

Treatment: Not much difficulty is experienced in reducing a luxation of the digits, if the character of the displacement is understood before commencing manipulations. In the backward dislocation, the base of the luxated bone is found resting upon the dorsum of its proximal fellow and the distal part is in a state of flexion. The patient being under the influence of chloroform, the surgeon flexes the luxated part still further, then placing the thumb firmly against the end of the displaced bone he makes extension and at the same time presses the base of the phalanx into place. In the forward luxation, the distal part of the phalanx is extended; here the first step in the procedure to reduce the injury is to farther extend the displaced portion of the digit, before placing the thumb against its base to act as a fulcrum, when forced extension is made. In cases where the ends of the luxated bone escape through a rent in the capsule and more or less laceration of other tendonous structures ensues, the reduction is accomplished with difficulty.

The after treatment following a reduction of displacements of the phalanges will consist of the adjustment of a small, straight splint to the palmar surface of the finger, which may be held in place by a few turns of a strip of adhesive plaster. After a few days this should be removed and passive motion begun, to prevent anchylosis. If the injury to the soft parts be severe, to prevent a high grade of inflammation, cooling lotions should be applied for a day or longer if needed.

DISLOCATION OF THE HIP

It requires the exhibition of considerable violence to cause a luxation of the head of the femur from the acetabulum, which needs tearing the capsular ligament and more or less injury to the other soft structures contiguous to the coxo-femoral articulation, but from reliable statistical authority, it is determined that dislocation of the hip constitutes about two per cent of all other displacements.

The luxation of the femur is due to one of several extreme positions to which the leg may be carried; forced extension, flexion, rotation, adduction, and abduction. Males between the ages of twenty-five to fifty are very liable to the accident; wo-

Fig. 359.—Dislocation of the femur backward and upward, the head resting upon the dorsum of the ilium. (*Howe.*)
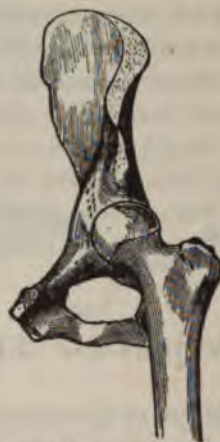
Fig. 360.—Dislocation of the femur forward, the head of the bone resting on the pubes.

men are less liable, principally on account of their not being subjected to the exposed violence that men are. Children and the aged are more likely to meet with fractures from the same degree of violence.

Luxation of the femur may take place in four directions;
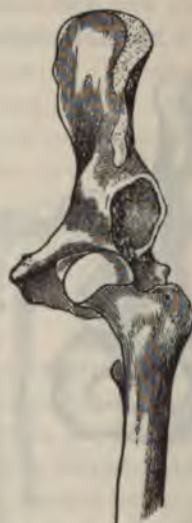
Fig. 361.—Dislocation of the femur downward, the head of the bone resting in the thyroid foramen.

upwards and backwards on the dorsum ilii (the most common form); backwards and slightly upwards, into the great ischiatic notch; forward and down into the obturator foramen; forward and upwards, the head resting upon the pubes.

In the former displacement, the head of the femur leaves the acetabulum and rests on the dorsum ilii, at a distance to give a shortening to the limb of one-half to three inches. Being forced into this position the capsular ligament and the ligamentum teres, of necessity, are ruptured and torn, and the external muscles are forced into a state of tension. The limb is usually flexed and inverted, the toes resting near the ankle of the opposite foot and the knee across the thigh of the opposite leg. Voluntary motion is lost, and extension and abduction are impossible; the prominence of the great trochanter is noted just above the acetabulum.

Fig. 362.—Reducing a forward dislocation of the femur by the manipulating method. (*Howe.*)

Treatment: The reduction of a dislocation of the hip is best accomplished by manipulative methods; however, exceptional cases may present where the aid of the traction pulleys might be successfully utilized. The manipulative method is executed as follows: The patient being thoroughly under an anæsthetic, and placed upon his back, the surgeon grasps the ankle and knee and flexes the leg upon the thigh; the next step is to strongly adduct the leg and carry it by a sweeping motion upward over the opposite thigh and abdomen as high

as it can be conveniently done, all the time pressing the knee inward as represented in the accompanying cut; now abduct the knee carefully, turn the foot so that the toes will point outward; then carry the foot across the opposite leg and at the same time a rocking motion should be imparted to the limb; while this procedure is being carried out the head of the femur will slip back into place with a jerk-like movement, when the leg will readily return to its normal position. In executing this manipulative procedure these points must be kept before the mind of the operator; the leg must be forcibly lifted during the time the sweep upward and outward is given to the limb to facilitate the return of the head of the femur to the acetabulum, otherwise it may slip into the inchiatic notch or perhaps the thyroid foramen. Again it will be necessary that the head of the femur be returned to the acetabulum by way of the rent in the capsular ligament through which it escaped at the time the injury was received; hence it is of importance to gain a knowledge, if possible, of the position the leg assumed when the displacement took place before attempting reduction. Even under the most favorable circumstances, several attempts may have to be made before the head of the femur is made to slip into the acetabulum. Then again, the rim of the acetabulum may become displaced by fracture, preventing a retention of the head of the femur in the socket after it has been successfully returned to it, unless resort is had to extension and counter extension during the period of convalescence.

The symptoms of the displacement of the head of the femur downward and forward into the obturator or thyroid foramen, are limit of motion of the leg; leg usually abducted; position of the foot slightly everted; length of the leg increased from one to two inches; and the great trochanter is less prominent than normal; and the head of the femur can often be felt in this abnormal position.

In attempts at reduction of this form of displacement, the leg is flexed on the thigh and the flexed limb carried well toward the body and then into extreme abduction, or if possible, to the point that the leg was carried when the dislocation occurred. The limb is held in this position by the surgeon, plac-

ing one hand firmly upon the knee, while with the other he grasps the inside of the thigh near the body and pulls or lifts the head of the femur upwards and outwards into the acetabulum.

Care must be taken to have the head of the bone return through the rent in the capsular ligament during the manipulative maneuvers, otherwise, the head may be made to encircle the socket instead of entering it.

While a dislocation of the head of the femur upwards and inwards upon the pubes may present some symptoms at variance with that of the thyroid luxation, the manipulative procedure for reduction is along the same line as followed in the treatment of that form of displacement. In this displacement the leg is abducted, everted, and usually shortened from one to two inches. There is a noted depression of the trochanter, and the head of the femur can be readily outlined on the pubes or above it. The surgeon should be on the alert that he does not confound the symptoms of this and other forms of dislocation of the hip with those of fracture, for there are some symptoms in common to both, especially as regards pain, shortening, and deformity; but the rigidity usually present in dislocations and the eliciting of crepitus made possible in fracture are differential symptoms that should be kept before the surgeon's mind during his examination.

In crushing injuries, luxation of the hip takes place that may not come directly under any one of the classified forms mentioned above, but modifications of some one of them, and as every case will have features that will be peculiar to itself, the surgeon will have to choose which of the manipulative methods mentioned above will prove efficient in aiding reduction. The after treatment will consist of rest in bed with the leg steadied between sand-bags for two or three weeks. On leaving the bed, the patient should go about on crutches, a sufficient time to enable the injured joint to assume its normal state.

Displacement of the hip of two to six months standing is spoken of as ancient dislocation, and while inflammatory changes about the coxo-femoral articulation often prove a barrier to the return of the femoral head of the socket, yet re-

duction has been accomplished in numerous cases of several months' standing. The manipulative method in attempts at replacement of these ancient cases have alone proved the most effectual.

Congenital dislocation of the hip is frequently met with, especially among the poorer classes. While there has been no satisfactory reason given for the frequency of the affection among girls, yet statistical tables show that upwards of eighty per cent occur in females. The causes of congenital displacement are structural defect of the acetabulum or femoral head, and a laxity of the muscles and ligaments connected with the articulation during the period of fœtal life. Numerous cases occurring in a relationship gives rise to the thought that heredity cuts something of a figure in the etiology of this form of luxation. Owing to the abnormal position of the head of the femur, some of the muscles about the joint are lengthened, and others shortened; of the latter, the adductor muscles are the ones affected, as well as the psoas and the iliacus. In most cases the hamstring muscles are also shortened. The muscles that are lengthened are the gemelli, glutæi, and the obturators. The ligaments connected with the joint usually accommodate themselves to the altered position of the head of the bone.

The symptoms of congenital dislocation of the hip do not usually become manifest until about the time the child commences to walk, which occurs about the age of two to three years and is characterized by a marked waddling gait with more or less arching of the back when the dislocation is bilateral, and instead of the waddling gait there is a decided limp and a noted shortening of the leg when the affection is unilateral. The patient learns to walk gradually and never shows evidence of pain on moving about.

A correct diagnosis of this affection is mainly based on the abnormal position of the trochanters, being located above Nélaton's line, which extends from the superior spine of the ilium to the tuberosity of the ischium. In a moderate degree of displacement the diagnosis may be somewhat obscure, but upon manipulation the legs will be found unusually movable and especially in bilateral dislocation, easily everted. In making traction on the leg with one hand and the other pressing firm-

ly over the displaced head of the femur it can readily be felt to descend and again return on releasing the leg. In cases of long standing the characteristic features of congenital displacement are so prominent that a correct diagnosis is easily made. Some recent cases may be so obscure that a skiagraphic examination is often necessary to determine the true state of the joint. Trendelenburg observed that there was a perceptible drop in the opposite buttock when the patient stood upon the affected limb, flexing the well one at the knee, which is not the case when both hips are normal.

Congenital dislocation is to be differentiated from traumatic dislocations, coxa vara, deformity following arthritis and infantile paralysis, and a separation of the epiphysis. In all these affections a history of the case will aid in determining the true state of the disease.

The successful treatment by other than operative measures have proven failures in the majority of cases even in the hands of some of the most noted orthopedic surgeons of the world; the most popular method thoroughly tried out being that of extension and counter extension. And to attempt a reduction of the displacement by operative measures the surgeon, to be successful, must have a thorough knowledge of the anatomy of the articulation and the vessels and muscles contiguous to it.

To the operative method of Hoffa and the manipulative procedure of Lorenz in reducing the congenital displacement of the hip and their manner of after treatment, great credit is due for an increased percentage of useful limbs. Briefly given the successive steps in the Hoffa operation are as follows: the patient under an anæsthetic, the limb extended, abducted, and slightly rotated outward; make an incision from the anterior superior spine of the ilium on a line obliquely downward and backward crossing the femur a half inch or more below the trochanter. Now deepen the incision down to the acetabulum avoiding injury to the muscles by retracting them as the dissection progresses. After reaching the capsular ligament it should be incised on a line of the incision made through the skin and fascia, and of sufficient size to enable the surgeon to readily execute any operative work that may be

deemed necessary. With the thigh placed at right angles with the body the attachment of the capsule should be entirely freed from the neck of the femur including the lesser trochanter. The next step is to sever the ligamentum teres and force out through the incision the head of the femur which should be pulled aside sufficiently to expose the acetabulum or the capsule covering it. If for any reason the capsule will not yield from its contracted condition above the socket, it should be split or enlarged with a dilator, that the socket be well exposed, and if found shallow or filled with connective tissue it should be deepened with a sharp curette. This done, the head of the femur is examined and if found too large it is advised to shape it to the convenience of the socket by paring away a sufficient amount of the cartilaginous end, although this procedure may eventually result in ankylosis unless passive motion is commenced quite early in the course of recovery. In returning the head of femur to the socket great care should be taken that no portion of the capsule or other adjacent tissue becomes imbedded beneath the head, otherwise the reduction will prove a failure. If the capsule is not entirely severed from the lesser trochanter and the adjacent neck of the bone this will be a contributing feature for the displacement of the femur after it is once reduced if the limb is extended or adducted. After reduction special care should be given to efficient drainage which is provided for by rolling into a small strand a strip or two of iodoform or plain sterile gauze which should extend from the articulation to the surface.

After the reduction has been accomplished, the capsule should be closed with sterile catgut sutures and the overlying structures with the same or with chromicized catgut. The limb is placed in a slightly abducted position and a plaster-of-Paris bandage applied, extending from the navel to the foot, cutting a little space or window at the site of the drainage tube to provide for cleanliness.

The Lorenz method of reducing congenital luxation of the hip is as follows; the patient fully under chloroform, extreme extension and flexion with rotation of the limb is made to overcome the contraction of any and all muscular and tendonous structures that might interfere with the replacement of the head

of the femur to the acetabulum. In order to facilitate the manipulative work the patient is placed upon its face while the hyperextension of the leg is made, and then upon its back when the limb is, by repeated efforts, flexed till it is made to touch the body. The adductor muscles must be completely overstretched or torn by abducting the limb to the extreme, while at the same time the surgeon uses extreme massage to this group of muscles, or strikes heavy blows upon them with the edge of the hand. Attempts at replacement should now be made by grasping the leg just below the knee, flexing the leg upon the thigh and the thigh upon the abdomen with one hand, while with the other the pelvis is grasped and with the thumb pressing hard against the trochanter a forced effort is made to push the head of the femur into place.

If the first effort proves unsuccessful the muscular contractions should be more thoroughly overcome by hyperextension and flexion, abduction and adduction, when another trial at reduction is made. If successful the return of the head of the bone to the socket is declared by a sudden jerk-like movement. The leg should now be brought down beside the well one when careful measurements will determine a successful reduction.

The after treatment consists in the application of a firm plaster-of-Paris cast adjusted to the pelvis and thigh, extending to the knee, so as to hold the thigh at about right angles to the body and well abducted. The limb held in this position relaxes the muscles and tendons, which is the principal feature exerted in a redislocation, besides the angle at which the leg is held forces the head of the femur firmly into the socket at every attempt at walking. In the course of five or six weeks the cast should be removed and another adjusted with the leg placed a little nearer the median line, but flexed and abducted as at first. The plaster cast should be worn for a period of six to ten months as will be determined by the progress made in recovery, and during this period the leg should be carefully but forcibly rotated once or twice a day to prevent too great contraction of the muscles extending from the pelvis to the great trochanter. In the majority of cases a change of the plaster cast may be necessitated two or three times during the period of recovery, each time placing the limb nearer the normal position; favorable cases may

have the limb placed at an angle of about forty to forty-five degrees from the first.

Regarding the advisability of allowing the patient to walk about after the lapse of two to four weeks by placing a high heel under the foot of the flexed leg, expecting the movements to deepen the socket, the opinion and experience of surgeons are at variance, although excellent results seem to follow the patient's moving about as freely as possible while wearing the cast, and having the leg rotated inward while making extension upon the foot and ankle. After the plaster cast has been removed, daily massage and movements of the limb will contribute to a rapid recovery.

Double congenital dislocation of the hip is more difficult to treat successfully than single, especially by the Lorenz method. By his method both hips are to be treated at the same time, while in the Hoffa's procedure by open incision one hip is usually operated on at a time. The latter method is usually more successful in cases over ten years of age, and in cases under this age where relapse persistently follows reduction by the Lorenz's method. The age of three to five gives better results from the manipulative procedure than under that age.

Relapses are due to incomplete reduction, an infolding in the socket in front of the head of the femur of a portion of the capsule, a shallow acetabulum, and an extreme weakness of the capsule and joint muscles affording but little restraint to displacement.

Serious accidents often attend manipulative efforts at reduction of congenital displacements of the hip, hence it behooves the surgeon to use great care in displaying force especially in old and resistant cases. Rupture of the femoral blood vessels, fracture of the neck of the femur, paralysis of the muscles of the limb, and fracture of the pelvic bones are the more common accidents referred to.

DISLOCATION OF THE KNEE

A dislocation of the tibia from the articular surface of the femur is an accident due to the application of great violence. It

is not a common accident, constituting as it does about one per cent of all other dislocations. The tibia may be displaced backward, forward, inward and outward; complete or incomplete; simple or compound. It is an injury that befalls men who are engaged in extra-hazardous vocations and is frequently attended with serious wounding of the soft structures.

Fig. 363.—Lateral dislocation of the tibia. (*Howe.*)

The symptoms of the backward displacement are a fullness in the popliteal space caused by a projection backward of the head of the tibia, leaving a marked depression in front of the knee; the leg is usually hyperextended, and the muscles are in a state of great tension. In extreme displacements the crucial ligaments and other soft structures are usually lacerated. The head of the tibia can usually be felt above and behind the condyles of the femur. The pressure upon the vessels and nerves gives rise to severe pain, and if rupture of the popliteal artery results there will be absent pulsation of the posterior tibial and dorsal pedis arteries.

Treatment: Reduction is accomplished by manipulation, the patient being first placed under chloroform. Traction should be made from the foot and ankle, while the surgeon makes pressure

and counter-pressure upon the end of the femur and the head of the tibia. Cases complicated with laceration of the tissues and blood vessels may require amputation, but a sufficient time should be given the recuperative powers of the structures involved to recover the vitality of the limb, but if gangrene manifests itself the surgeon should not delay operative procedures.

In dislocation of the head of the tibia forward (the most common form) the leg is more or less extended, with a marked projection forward of the head of the tibia and patella, the condyles can usually be felt in the popliteal space, there is laceration of the ligaments about the joint, and severe pain in attempts to move the limb.

This form of injury may result from external force directed against the front of the thigh just above the knee, or directed against the back of the upper part of the leg.

Reduction is accomplished by traction by an assistant while the surgeon presses the ends of the displaced bones into place. While traction is being slowly made from the foot and ankle the limb should be slightly rotated to aid in "unlocking" the head of the tibia from the lower end of the femur. It is not advisable to forcibly extend the leg and attempt to force the head of the tibia down into place as this procedure is likely to rupture or at least severely injure the nerves and blood vessels in the popliteal space. Compound and complicated injuries received at the time of the luxation should be treated conservatively, giving time for the vitality of the leg to recover, if this is possible; otherwise amputation will be necessary.

Inflammatory and painful states of the joint are best treated with topical applications of anodyne and cooling lotions. An efficient mixture is the following:

℞.
    Menthol Crystals .... ℨss
    Ether .... ℥j
    Spirits of Camphor .... ℥vij
    M. Sig.—Apply to painful parts every hour or two.

If the action of this mixture is slow, cover the part with oiled silk or brown paper for a few minutes after applying the lotion.

On account of the great breadth of the knee joint, lateral displacements are seldom complete. They may be simple or

compound. The causes of lateral luxations of the knee are lateral flexion and violent blows directed against the outer side of the upper end of the tibia or on the inner side of the lower end of the femur in the inward displacement, while the force applied to the knee is just the reverse to produce the outward displacement. Falls producing extreme abduction or twist of the knee and the effects of moving machinery are also given as common causes.

The common symptoms observed in lateral luxations are pain, deformity, abnormal breadth of the knee joint, leg usually more or less flexed, the foot adducted or abducted, according to which one of the displacements is presented. There is limit of movements of the leg, and a marked displacement of the patella to one side or the other. The displacement can hardly take place without lacerating the lateral and crucial ligaments to a greater or less degree.

Reduction of the lateral dislocations of the knee are usually accomplished with ease. Traction by an assistant, while the surgeon coaptates the ends of the displaced bones by pressure and counter-pressure by the thumbs and fingers will generally accomplish the replacement of the tibia.

The after treatment consists in keeping the leg quiet for three or four weeks by the use of sand bags, and the topical application of the cooling lotion mentioned in the treatment of the dislocation of the knee forward. Passive movements of the leg should be delayed for four or five weeks in most cases, and longer in complicated injuries.

Severe complications occurring with dislocation of the knee joint usually excite the utmost concern, even among surgeons of experience, as the accident is considered one of the most dangerous that can happen to any one of the articulations. This is due largely to the fact that the joint has large articular surfaces, which if exposed to the air, adds largely to shock that is produced by injury to the soft structures that is likely to end in suppuration.

The treatment of these compound injuries consists in placing the limb at rest and the free use of quite warm antiseptic solutions. The alkaline antiseptic solution mentioned previously in this work is commended in this form of injury in connec-

tion with the use of heated sand-bags or hot-water bottles placed around the leg to sustain heat. As soon as it becomes evident that the vitality of the limb is lost, which is shown by entire arrest of pulsation in the distal arteries, loss of sensation, the limb becoming swollen and discolored, amputation should at once be resorted to, to further the chances of saving the life of the patient.

DISLOCATION OF THE PATELLA

If the patella is dislocated, it is generally to one side or the other, outward or inward; seldom is it forced upon its edge, although it has been observed in this position.

The outward displacement is the most commonly met with, and is usually the result of violent force applied against the inner border of the bone, or to the display of muscular action while the knee is extended.

There are different degrees of displacement of this sesa-moid bone (for such it really is), the variation depending upon the amount of force displayed; hence the luxation may be complete or incomplete. It is an accident that befalls persons of hazardous occupations. whose ligaments are markedly lax.

The symptoms of the outward displacement are deformity, and pain; the leg is slightly flexed and immobile.

Treatment: The patella is usually quite easy to replace. The leg is extended while the surgeon presses the bone into place with his thumbs. The after treatment consists in applying strips of adhesive plaster over the patella, extending part way down each side of the knee, which will serve well as a retaining dressing to prevent relapse. It will be well to keep the leg at rest for ten days or two weeks, placed between sand-bags or steadied upon a straight splint. When getting up and about, a rubber cap may be worn to advantage.

The causes of the inward displacement are generally direct violence displayed against the outer edge of the patella, and the effect of moving machinery.

Muscular action, falls and blows are the usual causes of the edgewise displacement, with the articular surfaces facing

inwards and the internal edge generally resting between the condyles. Dislocations of the inward and edgewise variety or forms are treated in about the same way as was the outward displacement. The patient should be thoroughly relaxed with chloroform when extension and rotation, assisted by forcible pressure, directed against the patella will quite readily replace it.

DISLOCATION OF THE FIBULA

By a display of violence against the fibula, either by muscular action or from external force directed against it, the upper end may be displaced forward or backward. The accident frequently happens in connection with a fracture of the tibia.

In the forward displacement, the head of the fibula can be felt and observed in front of its normal position; there is sharp pain in attempts at walking; and the natural contour of the limb is destroyed. In the backward dislocation, the head of the fibula is observed back of its normal position; the foot is usually more or less everted; and pain is felt in efforts to move the leg.

Treatment: In attempts to reduce the forward displacement, the leg should be extended and forcibly rotated outward while the head of the fibula is pressed backward into place. The leg should be kept at rest with the aid of sand-bags, splints or the application of a plaster cast, for two or three weeks.

To reduce the backward dislocation of the head of the fibula, the leg is more or less flexed to relax all tense muscles and tendons, during which time the end of the bone should be pushed into place. The after treatment requires that the leg be kept slightly flexed and at rest. The end of the bone can be securely held in place by the application of two or three strips of adhesive plaster, extending across the head of the fibula and part way around the limb.

In displacements of the lower end of the fibula, which are occasionally observed as the result of crushing injuries, reduction is not so easily accomplished. The procedure is to flex and rotate the leg while the end of the fibula is pressed into position; this accomplished, the leg is kept at rest for two or three weeks.

DISLOCATION OF THE ANKLE-JOINT

Dislocation of the foot upon the bones of the leg is not an uncommon accident. The foot may be displaced forward, backward, and to either side. In describing these different luxations of the ankle-joint in the order of frequency in which they generally occur, the outward displacement will come first. This displacement rarely occurs, except it be in connection with a fracture of the fibula a few inches above the joint. The causes resulting in the outward dislocation of the foot are falls from extreme heights alighting upon the feet, twisting forces applied to the foot, and the crushing effect of heavy bodies directed against the ankle.

The prominent symptoms presenting in this form of displacement are pain, deformity, in which the foot usually rests on the inner side with the outer edge more or less elevated; there is a marked depression over the seat of the fracture of the fibula, and a noted projection of the internal malleolus. The internal lateral ligaments are more or less lacerated, depending upon the degree of displacement.

Treatment: The outward dislocation of the ankle is usually easy to replace. The foot should be forcibly extended and at the same time slightly rotated. To aid the manipulations, the leg should be flexed upon the thigh to relax the tension of the muscles. A rocking motion imparted to the foot, while extension is being made, assists in the reduction. The after treatment consists in adjusting the fractured fibula and the application of two padded splints, secured by strips of adhesive plaster or strands of muslin. In a week or ten days a plaster-of-Paris dressing should be run on, which should be worn for three to four weeks, 'or until the ankle recovers its normal state. The plaster cast may be cut down in front after being worn a few days and sprung off the leg, giving an opportunity for bathing and massaging the injured part, when it should be again adjusted.

The inward displacement is generally caused by some force inverting the foot to an extreme degree, or twisting the foot to an extreme adduction. Falls from a height, striking on the

outer edge of the foot, are perhaps the most common cause of the injury.

The symptoms attending this injury are pain, more or less inversion of the foot, a prominence of the external malleolus, and usually a depression at or near the internal malleolus. The joint has a greater width than in the normal state.

Reduction is usually accomplished easily by traction and rotation and everting the foot. The same after treatment recommended in the outward displacement should be adopted in this form, and if no serious complications attend the injury, a normal state of the joint may be expected.

It is very important that the broken fragment of the fibula be held in position to insure a firm union to the shaft of the bone, otherwise the ankle remains weak.

In dislocation of the foot backward, the foot including the astragalus, is forced backward to a greater or less extent, the lateral ligaments are lacerated, and not infrequently the capsule is ruptured. Fracture of one or both malleoli frequently complicates the injury.

This form of dislocation of the ankle is quite common, and is usually the result of jumping from a height or swiftly moving conveyance, forcing the foot backward, producing extreme flexion of the foot. If the dislocation be complete, the displacement lacerates the lateral and the anterior ligaments, allowing the tibia to assume a position in front of the astragalus. Falling backward while the foot is firmly held is given as one of the common causes of this form of dislocation.

The symptoms of this form of displacement are more or less deformity, depending upon the degree of displacement; if the fibula be fractured, the fragment of the bone will likely be found accompanying the displacement of the foot backward.

To reduce this form of displacement, the surgeon should grasp the heel and toe of the foot and make forcible extension, at the same time rocking or rotating the foot to aid in adjusting the dislocated parts. It may be necessary to flex the leg to some extent to relax the opposing muscles and tendons, before the luxated bones can be pushed into position.

Following the replacement of the dislocated bones, the foot and posterior part of the leg should be encased in a plaster cast

to prevent recurrence. If the injury to ligaments and capsule be extensive, as is frequently the case, topical application of soothing and cooling lotions will be indicated for a few days to reduce inflammatory action. It will be necessary to keep the foot at rest for three or four weeks followed by massage and passive motion.

Dislocation of the foot forwards is of rare occurrence and is usually produced by some force that flexes the foot upon the leg, forcing the end of the tibia and fibula down behind the astragalus. Falls are responsible for the accident, where the heel comes in contact with the ground with the toes well elevated.

The symptoms indicating this form of displacement are a lengthening of the front of the foot and a shortening of the heel with more or less bulging fullness at each side of the tendo Achillis. The malleoli are found much nearer the ground when the patient attempts to stand, and the summit of the astragalus can be felt in front of the end of the tibia.

Reduction of the forward displacement is accomplished by forcible traction and direct pressure. To aid in replacing the luxation, the patient should be put under the influence of chloroform, that the muscles and tendons may be thoroughly relaxed. The traction should be made by an assistant, directed by the surgeon, while he pushes the luxated bones into place. As there is always extensive laceration of the ligaments and capsule in this form of displacement, and not infrequently fracture of one or both malleoli, especially in crushing injuries, topical applications of cooling lotions should follow the reduction, to reduce inflammatory action. Once the displacement is reduced, the leg should be kept at rest for three or four weeks, or until the injured structures have had time to recover something near their normal condition; then massage and passive motion should be made use of several times a day until the patient is able to bear his weight upon the foot.

After all inflammatory action has been subdued, the ankle can be encased in a plaster cast, which should be worn for four or five weeks or until the ankle has sufficiently recovered to make its use no longer necessary.

DISLOCATION OF THE TARSAL BONES

Owing to the substantial structure of the ankle joint, a displacement of the several bones seldom occurs; and when such an accident does take place, it is usually the result of a crushing injury or twisting force applied to the foot and ankle.

The displacement of the astragalus may take place forward, backward, outward and inward, the forward luxation being the most commonly met with.

In all of these luxations, the deformity is marked; the displaced bone is readily recognized out of its normal position; the ligaments that bind the astragalus to the adjacent bones are lacerated, the foot is adducted, inverted and canted inward in the outward displacement; abducted and everted in the inward and forward dislocation. In the luxation backward, the astragalus can be felt back of the ankle, forcing the tendo Achillis markedly backward, or it may be located at one side of the head of the astragalus. Not infrequently fracture of the malleoli and a separation of the fibula from the tibia results from the force that causes the displacement. In compound luxations of the astragalus, the projecting part of the bone is often found protruding from the wound.

In the displacement forward (which is rare), the astragalus rests in front of the ends of the tibia and fibula, the foot usually inclines inward, and is not usually held in a state of tension. The malleoli are frequently broken and the tendons of the extensor muscles lacerated.

Treatment: The reduction of the several displacements of the astragalus is accomplished by forcible traction upon the foot by an assistant, with rotation and perhaps, rocking movements, directed by the surgeon, while he exerts forcible pressure with his thumbs to adjust the displaced bone.

To aid in the manipulative work, the patient should be thoroughly under chloroform and the leg more or less flexed upon the thigh. Unless the assistant possesses considerable strength, pulleys may have to be called into use to overcome severe spasm of muscular structure often met with in stout muscular subjects. Where, for any reason, the bone can not

be reduced, it should be cut down upon, the opposing structures incised or pulled to one side, while the reduction is accomplished. Where the astragalus is fractured, it often becomes necessary to remove the bone, especially when the soft structures are badly lacerated. In cases where this has been done, the patient has recovered with a very useful foot.

The after treatment consists in keeping the foot at rest, and the application of cooling lotions to subdue inflammatory action. In crushing injuries to the foot, some precaution should be exercised to prevent suppuration and infection. In compound injuries, the astragalus should be reduced, if possible, and attention should then be directed to preserving the integrity of the surrounding tissue. The topical application of a solution of boric acid, or the alkaline solution, frequently alluded to in other parts of this work, will prove efficient here.

The cuneiform bones may be displaced singly or all together from a crushing injury to the foot. The direction that the bones take when displaced, is usually upward and inward. Owing to the thin covering of the bones, the deformity attending their displacement is pronounced.

To reduce a displacement of these bones, the foot should be grasped and the distal part depressed and extended by an assistant, while the surgeon presses the bones into place; this is very easily done in the majority of cases.

Displacement of the cuboid and scaphoid bones seldom takes place.

The accident is always due to crushing injuries to the foot, forcing or tearing the bone from its attachment to the other bones of the arch. The scaphoid, when displaced, is usually found to occupy a position upward and forward from its normal situation, and the cuboid bone is generally forced downward, upward or inward.

Reduction is accomplished by forcible manipulation. If the foot be extended, everted, and bent downward, the surgeon is generally able to press the luxated bone into place; this accomplished, the bone is not liable to again slip out of place.

DISLOCATION OF THE METATARSAL BONES

The metatarsal bones may be dislocated singly or all together, and is the result of a twisting or extreme crushing force applied to the foot.

The first metatarsal bone is more frequently displaced than any one of its fellows, and is more often fractured than dislocated. A crushing force that is responsible for the displacement may force the end of the bone beneath the other metatarsal bones, but it is usually found displaced upward. The reduction of a displacement of this bone is accomplished by making forcible traction upon the great toe with one hand while with the other the surgeon presses the end of the bone into place.

A displacement of the other metatarsal bones may take place singly but the accident is seldom observed. Severe twisting force is responsible for the luxation whenever it occurs. It is possible for these bones to be displaced upon the dorsum of the foot, or forwards, and even backwards. If all of the metatarsal bones are displaced together, they may assume a position downward, or outward, upward and inward.

There is hardly a possibility of making an error in the diagnosis of a displacement of one or more of the metatarsal bones, owing to the thin covering of soft structure and the true outline or mould of the foot. The symptoms usually present an elevated position of the portion of the foot directly in front of the ankle-joint, while the latter preserves its normal position to the bones of the leg. Or in case of the first or fifth metatarsal bone being displaced the inner or the outer edge of the foot will be depressed or elevated according to the disposition of the luxated bone.

Treatment: To replace the luxated bones, the surgeon should make forcible extension downward with one hand while with the other he pushes or presses the dislocated bones into place while an assistant makes counter-extension upon the heel and ankle. The replacement is not always easy to accomplish by the method just outlined, but having the patient fully under an anæsthetic the surgeon, by exerting powerful manipulative force with one or both thumbs will bring about reduction if such be

possible by any method of procedure. Once the reduction is accomplished the foot is placed at rest, relieving pain and inflammation by sopping the injured part with the following solution:

Crystals of Menthol .... ℥j
Ether .... ℥j
Spirits of Camphor, q. s. ....fl. ℥vj
M. Sig.—Apply externally every hour or two.

DISLOCATION OF THE PHALANGES OF THE TOES

A dislocation of the toes at the metatarsal-phalangeal articulation is frequently met with, especially of the great toe, which may be displaced upward, backward, and to the outer side. In displacement of the phalanges of the other toes the base of the bones is usually forced upward and backward upon the metatarsal bones. Crushing injuries, kicks, and falls are the common causes of dislocation of the phalanges of the toes. The injury is frequently compound, especially is this apt to be the case when the accident is due to twisting or crushing injuries.

Use traction while depressing the toe with one hand, and with the thumb of the other direct pressure is made against the base of the displaced phalanx; the toe is forcibly extended and the bone is pushed into place. In compound injuries this cannot always be accomplished, it then becomes necessary to excise the head, and sometimes a portion of the metatarsal bone.

A dislocation of the distal articulations of the toes is seldom observed; when such an accident does take place it is usually the result of falls upon the toes, or kicks against some solid object. The displacement is attended with acute pain, and deformity.

Treatment: Reduction is accomplished by traction and pressure against the base of the displaced bone. The after treatment will consist of the adjustment of a padded splint to the sole of the foot which should be held in place by strips of adhesive plaster, and worn for two or three weeks. In severe compound injuries it often becomes necessary to amputate the lacerated member.

PART· TWENTY-SIX

Excision of Bones and Joints

In necrotic disease of the bones, whether in the joints or in continuity, where loss of limb and perhaps the life of the patient is placed in jeopardy, an effort should be made to remove the diseased portion of bone by cutting down upon it and with saw and chisels, exsect it out.

Other morbid states of the bones, as unreduced dislocations, deformities which cause more or less functional derangement, compound and complicated fractures, may require resection of a part, or all, of some one of the bones, complicated in the abnormal condition.

To depend upon the ultimate recovery from minor degrees of caries and necrotic affections of the bones of one or more of the joints, the general health of the patient will have to be taken into consideration, and a careful estimate made of the recuperative forces to hold in check the extension of the morbid state to adjacent parts. As every case of disease or deformity of the bones has some features peculiar to itself, no definite rule along the line of treatment, either medical or surgical, can be suggested that will adapt itself to even the majority of cases.

The principal object to be attained in the resection of one of the bones of the wrist or ankle joint, for example, is to save the limb from amputation, and yet preserve the function of the joint and make it as serviceable as the crippled condition will permit of. Excision of the large joints should not be undertaken, except the general physical condition of the patient gives promise of withstanding the shock and at the same time aid, by the recuperative forces, the process of repair. Excision, when practiced on the young and robust, usually does well; not so when practiced on the aged and those reduced from ex-

haustive diseases. When the long bones are attacked with osteo-sarcoma or other malignant disease, amputation had better be done at once, when feasible.

Excision of the Wrist

If it becomes necessary to remove a part or all of any of the bones entering into the formation of the wrist joint, on account of an injury or diseased condition, the bony structures are easily reached from the back and sides of the articulation, as the osseous structures are merely covered, in these regions, with skin, fascia and tendons.

An Esmarch bandage is run on the hand and forearm up to the elbow, just above which a rubber tourniquet is tightly adjusted and tied. With the forearm and hand surgically prepared and the patient under an anæsthetic, an incision is made upon the dorsal surface of the hand, commencing at the middle of the inner or ulnar border of the metacarpal bone of the index finger, and extending upward over the posterior surface of the wrist to a point on the inner border of the radius, about one inch above the articulation. Note the line of incision in the cut. The incision divides the skin, fascia, and fat down to and on a line with the outer border of the extensor tendon of the index finger, the sheath of which should be carefully avoided during the deep dissection. With retractors, the edges of the wound should be held apart by assistants while the joint is approached by incising the deep structures, avoiding injury to extensor tendons, as they are exposed. The deeper tendons are drawn to one side, when dissecting up by blunt retractors and the joint opened by cutting through the posterior ligament at a point usually between the tendons of the extensor secondi and the extensor indicis. The incision upon the radius should divide the soft, overlying structures, including the periosteum, if the ends of the radius and ulna are to be removed, and merely to the periosteum, where only the carpal bones are to be exsected. Over the lower end of the radius, the deep tendons, when separated, should be well retracted with blunt hooks, a part to the ulnar and the extensor secundi to the radial side.

Fig. 364.—Resection of the elbow and wrist joints. E, incision for resection of elbow joint; C,cuneiform; M, os magnum; S, scaphoid; SL, semi-lunar; T, trapezium; TD, trapezoid; U, unciform; W', incision of the wrist joint (McGrath.)

The soft parts are detached from the bones that will necessitate removal, with a periosteal elevator, and the tendons with their sheaths that lie in grooves are dissected out with the periosteum intact. After the joint is opened, the hand, if forcibly flexed, will bring the first row of the carpal bones into view and their removal will commence with the scaphoid and end with the cuneiform bone; the pisiform is left in place, if not complicated in the diseased process. With the hand and wrist still forcibly flexed, the second row of bones are made to appear in the gaping wound, and they are excised by commencing with the os magnum and ending with the unciform, if all are found in a morbid condition. If it is possible to save the trapezium, it will contribute largely to the usefulness of the thumb.

Where one bone is found necrotic, or for any other reason it is found necessary to remove it, the operation may be executed with a periosteum elevator or sharp enucleation spoon, aided by severing the ligamentous bands that hold the carpal bones in contact, care being taken not to wound the important arteries and veins that lie in close contact with the bones on the anterior part of the wrist and the palm of the hand. If the operator will bear in mind to keep the edge of the cutting instrument invariably against the bone during the process of dissection, there will be little danger of injuring important vessels and nerves in doing amputations or resections.

To remove some of the bones of the

carpus, will tax the skill of the surgeon somewhat, especially the unciform and the os magnum, on account of the hook-like process of the former and the muscular attachments of both bones. A useful and almost indispensable instrument in the resection of the bones of the carpus, as well as a part or whole of the bones of other joints, is the medium sized lion-jawed bone forcep, with which any one of the osseous structures may be seized and twisted out of its bed or relation with the adjacent structures.

Fig. 365.—Line of incision for excision of the wrist joint. (*Farnum.*)

If the ends of the radius and ulna, for any reason, are to be removed, the portion to be sacrificed, is first to be denuded of the overlying soft tissue, including the periosteum; the lower ends of the bones are then thrust out through the external wound and sawed through.

The wound is then cleaned of bloody discharges, the rubber tourniquet is removed and if there are no bleeding points presenting, the edges of the wound are partly united with silkwormgut sutures and the hand and forearm dressed upon a straight splint. It will be well to lightly pack the wound for the first three or four days with some one of the potent antiseptic gauzes, to afford drainage and to prevent infection, if possible. The wound should be redressed as often as the post-operative conditions demand.

Excision of the Elbow Joint

Partial or complete excision of the elbow joint is resorted to for the relief and cure of diseased conditions, traumatism, and ankylosis of the joint. The results obtained in the partial removal of the bones in the morbid states, even where the diseased portions can be entirely cut away, have not been as favorable as when the excision has been complete, that is, where the whole of the ends of the humerus, radius and ulna are cut away. In the complete operation, where morbid states will limit the work, the radius is sawed through its neck, the ulna at the base of the coronoid process, and the humerus just above the epicondyles. Cases will often present where the injury or diseased condition will require the removal of a greater portion of one or more of the bones entering into the formation of the articulation; but the usefulness of the elbow joint will be in the ratio of the amount of the osseous structure removed. Where several inches of humerus or radius are destroyed, or likely to be cut away, resulting in a loose or flail joint, it would be questionable whether or not the abnormal state of the joint would be preferred to that of ankylosis.

While the operative work is done by several methods, the results secured by the subperiosteal method seems to be in greater favor with modern surgeons, when conditions are favorable for its execution.

The method of Langenbeck is a popular one, and as it gives as good results as the others in vogue, its technique will be briefly given. After the arm has been prepared for the work, and to render the operation as bloodless as possible, an Esmarch bandage is run on the arm up to a point about six inches above the elbow, where it is supplemented by a rubber tourniquet passed tightly around the arm and fastened. With the patient anæsthetized and placed upon his back, the arm, well flexed at the elbow, is placed across the patient's chest and firmly held by an assistant. The operator may stand upon either side of the patient, although he usually prefers to stand on the same side of the patient with the arm on which he is to execute the work. An incision, five or six inches in length, is made posterior to the joint, commencing about two inches

Fig. 366.—Showing the line of incision in excision of elbow joint for necrotic disease. (*Farnum.*)

above the articulation and extending over the point of the elbow and down upon the posterior surface of the ulna to a point about two and a half inches below the joint, and a little to the inner side of the median line of the triceps muscle and the ulna. The incision should be made with a heavy scalpel and divides all the tissues to the bone over its entire length, including the periosteum and posterior ligament of the joint. The somewhat difficult feature of the operation is then commenced, of dissecting the periosteum with the attached and overlying tendonous structures free from the bones. In executing this part of the operative work, the edge of the knife is kept constantly against the bone, so as not to cut the tough membrane or sever its at-

tachment from its muscular structures lying in close connection. The most difficult part of the dissection will be experienced in passing over the epitrochlea, owing to the attachment of the internal lateral ligament. After the bones have been denuded of periosteum on the internal condyle, the dissection is directed to the external or outer side of the elbow, using the same precautions as before. As the work advances, the flexion at the elbow should be increased, which will aid in the work advantageously. To detach the periosteum from depressions and grooves, the periosteum elevator and bone chisel will prove useful even to cleaving a thin shell of the surface of the bone away with it. Bearing in mind the location of the ulnar nerve, lying in the groove between the olecranon and internal condyle, the chisel will prove useful in dissecting it out without injury. The sharp chisel will also be useful in clearing the external epicondyle of the overlying periosteum, with its attachment of the common tendon of the superficial extensor muscles.

Some operators seldom use the scalpel in excision of the elbow after making the first longitudinal incision, except it be to snip some little band of tough membrane that hinders the work being executed with the sharp periosteum elevator.

After completing the dissection of the periosteum from the ends of the humerus, radius and ulna, the ends of the bones are forced backward through the external wound and the end of each is sawn through at the anatomical points previously mentioned, or as near these points as the nature of the diseased condition will permit. After the ends of the bone have been cut or sawn off, the synovial membrane is inspected, and if found diseased, it should be dissected out with dressing forceps and curved scissors.

If due care has been taken, the important vessels and nerves will not have been injured during the dissection, hence none will need tying; but should there be found little spurting vessels after the removal of the rubber tourniquet, they can be picked up with a hemostat and twisted or ligated, if thought necessary.

The wound is next packed with iodoform gauze, over which the edges are approximated and united throughout most of its extent with interrupted silk-wormgut sutures. The surface of

the wound is then dressed with sterile gauze and the arm immobilized in splints or plaster-of-Paris cast in an almost extended position, in which it is kept for two or three weeks, after which time the arm is brought gradually to the position where it will be the most serviceable and retained in a plaster cast until ankylosis, either partial or complete, has taken place. If passive motion is practiced every day or two along toward the end of the healing process, a marked degree of motion can be established in favorable cases.

Excision of Ankylosed Elbow.

The operative technique for relief in ankylosis of the elbow joint is similar to that described in the complete excision of the joint for diseased conditions. The posterior longitudinal incision commences and ends at about the same points on the humerus and ulna, and the detachment of periosteum from the ends of the bone is done to the extent of the former operation, including the capsule, and is executed with the same precau-
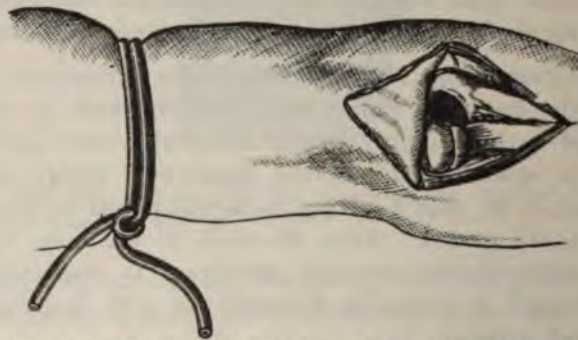
Fig. 367.—Exposure of the posterior portion of the elbow preparatory to executing an excision of a portion of the joint. (*Howe.*)

tions. To facilitate the backward displacement of the ends of the bones through the external wound, the end of the ulna and the head of the radius, if necessary, can be divided with the chain saw, or severed with a sharp chisel, great care being taken not to injure the important vessels and nerves on the anterior aspect of the joint. The articular end of the humerus is then

forced out of the wound and the necessary amount sawn off. The dressing of the wound and the after treatment will be the same as in the previous operation.

Operation on the Elbow for Unreduced Backward Dislocation

The usefulness of the arm is so seriously crippled in old unreduced dislocations of the elbow joint, that operative measures are often resorted to for relief. To approach the ends of the misplaced bones, an incision is commenced on the outer side of the humerus, about three inches above the articulation and extended downward, across the head of the radius and on downward posteriorly, for about three inches, along the line of the space between the radius and ulna. All of the soft structures are divided to the bone, including the capsular ligament. With the edges of the wound well retracted with blunt hooks, all adventitious tissue, either fibrous or osseous, found existing between the dislocated end of the ulna and the lower posterior part of the humerus is removed with a sharp bone curette or chisel, including the fibrous bands, frequently found between the articular ends of the humerus and the head of the radius. The next step is to fully retract the edges of the wound and expose the sigmoid cavity in the olecranon, which should be freed of all fibrous tissue and bands that are often present, binding the olecranon to the lower end of the humerus.

The fibrous bands on the inner side of the joint are next divided through a curved incision about four inches long, made opposite the first incision, commencing upon the humerus and ending about two inches below the joint, passing in its course, immediately behind the internal condyle. In dividing the tissues down to the bone, caution should be taken not to injure the blood vessels, and especially the ulnar nerve, which lies just beneath the fascia. With the bones freed of all inflammatory tissue, the dislocation is reduced and the wound dressed in the usual way, and the arm flexed at the elbow and immobilized in a plaster cast. If one or more of the flexor muscles have assumed an abnormal position, becoming markedly shortened, and

reduction is hindered in consequence, they should be separated from their attachment at the outset.

In the course of three weeks, or at the last of the healing process, passive motion can be made once or twice a day to establish, in some degree, a functional joint.

Excision of the Shoulder Joint

Results obtained in excision of the shoulder joint, as regards usefulness of the limb, are not as favorable as are excisions of the wrist and elbow joint, averaging the cases requiring this form of operation upon the articulations. The degree of use-
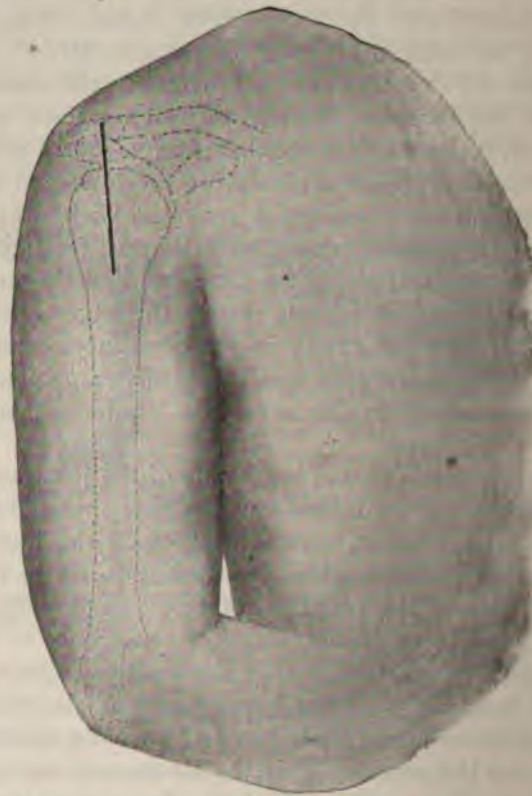
Fig. 368.—Showing line of incision in excision for shoulder joint disease. (*Farnum.*)

fulness will depend upon the morbid state requiring the opera-
tion, also the extent of the humerus removed.   In a case of gun-
shot injury to the upper end of the humerus, over three inches
of the bone was removed by the subperiosteal method with
the ultimate result of only one and a half inches shortening and
otherwise a very serviceable limb.

The operation consists in making an anterior longitudinal
incision, commencing above and to the outer side of the cor-
acoid process, and passing downward upon the outer side of the
arm for the distance of four or five inches, dividing all of the
tissues down to the bone, including the periosteum and capsular
ligament; the line of the incision passing between the greater
and lesser tuberosities so far as not to injure the important
muscles attached to these bony prominences; care being taken
not to sever the long tendon of the biceps muscle, which lies
deep in the groove between the two prominences of bone.   The
edges of the periosteum are raised and dissected-away from the
end of the humerus to the extent of the diseased process, using

Fig. 369.—Excision of the head of the humerus.

a periosteal elevator to accomplish the work. This done, as much of the head and shaft is then removed as shows evidences of a morbid condition. This may be done with a chain saw or chisel, or the upper end of the humerus may be forced out through the incision and sawn off. To facilitate the work, the edges of the wound are well retracted with blunt hooks. During the process of dissecting the periosteum free from the head and neck of the humerus, the use of the scalpel may be needed occasionally to snip tough bands of fibrous tissue that may be encountered.

If the glenoid cavity is filled with adventitious material, it must be removed with a sharp bone curette; also the synovial membrane should be excised with curved scissors, if it shows evidence of disease. If care has been taken during the dissection, not to injure the soft tissues, no important vessels will have been cut, hence none will need ligating.

The external wound is now ready to be closed, which is done with interrupted catgut and silk-wormgut sutures, with or without drainage, as the nature of the case will determine. One rule should be observed in incising and dissecting up the periosteum, that is to limit the work to the diseased area. After the wound is closed, the shoulder is dressed with sterile gauze pads, and the arm placed in the desired position and immobilized.

Excision of the Head of the Scapula

A part or all of the scapula is removed on account of traumatic injuries and diseased conditions, such as caries, necrosis and morbid growths.

To remove the head and neck of the scapula, a longitudinal incision is made from the base of the acromion to the fold of the axilla, dividing all of the tissues to the outer portion of the scapula. The tissues are well retracted, exposing the articular head of the bone, which is denuded of periosteum and cut away with a chisel or bone-cutting forceps. The removal may also be accomplished through the longitudinal incision made for resection of the head of the humerus, having the edges of the wound well retracted, the diseased head and neck cut away

with gouge forceps. The external wound is dressed in the usual way, with or without drainage and the arm flexed at the elbow and held in this position, a plaster-of-Paris cast is applied, after placing about the wound soft pads and sterile gauze.

Excision of the Hip Joint

Before attempting excision of the hip joint, a thorough knowledge of the anatomical relationship of the important muscles, ligaments, vessels and nerves, surrounding the articulation, should be had and·kept in mind as the operative work progresses. Portions of the bones entering into the formation of the coxo-femoral articulation are removed for the relief and cure of diseased conditions, traumatic injuries, and malignant growths. The established rule as regards the removal of bone tissue in resection and excision is to be rigidly followed here; if the cotyloid cavity be attacked with caries, the diseased patches are cut away with a chisel or gouge forceps till healthy tissue is reached. If the head of the femur or the trochanters show marked evidences of the necrotic degeneration, the entire portion of the shaft of the femur should be removed above the seat of disease.

The necessary instruments usually employed in excision of the hip joint, are two or three chisels, a heavy scalpel, osteotomes, retractors, mallet, and sterile pads and sponges.

The excision may be executed by one of two methods, either of which is feasible under favorable conditions; the **radical method** which is adopted in extensive diseased states of the joint, and in gunshot ‘or other serious comminuted injuries, where portions of the joint are cut away without efforts being made to save any part of the periosteum, and where it becomes necessary to divide freely some of the muscular and ligamentous attachments to the femur and pelvic bone; and the **subperiosteal** or **conservative** method, done where the diseased state of the bones has not advanced to that degree which renders the periosteum so abnormal that it cannot be raised from the upper end of the shaft of the femur, together with the attached muscles.

Fig. 370.—Line of incision in excision of the hip joint. (*Farnum.*)

To perform the radical operation, the patient is anæsthetized and placed on the healthy side, upon the operating or other table, arranged for the purpose. After the hip and thigh have been aseptically prepared, a curved incision is made with a strong scalpel, commencing midway between the anterior superior spine of the ilium and the upper border of the trochanter major, passing behind this projection and downward for a distance of two or three inches, dividing the skin, fat and fascia down to the muscles attached to the great trochanter. These muscles, near their insertion, are next separated from the great trochanter, after which they are pulled to one side by

Fig. 371.—Flap turned back in excision of the head of
the femur.

blunt retractors, exposing the neck of the femur and the ace-
tabulum. The next step in the operation is the division of the
capsular and cotyloid ligaments, following which the thigh is
flexed and carried slightly inward and rotated outward to
force the head of the femur sufficiently out of the cotyloid
cavity that the ligamentum teres may be cut, allowing the com-
plete escape of the head of the femur from the divided liga-
ments. The soft parts are kept well retracted, and protected
by a thin metal shield while the head and as much of the end
of the adjacent shaft as shows evidence of disease, is sawed
off with a small chain saw.

With the excision completed, and the bleeding vessels
picked up and ligated, the traumatic surfaces should be well
irrigated with a 1-3000 hot bichloride solution, after which, the
edges of the gaping wound are united with heavy silk-wormgut
sutures over a drainage tube of rubber or gauze, placed high
enough to thoroughly drain the cotyloid cavity. The external
wound is then dressed with sterile gauze dressings and lightly

bandaged and the hips and legs immobilized in "wire breeches" or a plaster-of-Paris dressing, provided with an opening over the traumatism to allow redressing as often as occasion demands.

After the resection of the head of the femur, the cotyloid cavity is closely inspected for points of necrosis, and if such are found, the dead tissue is to be carefully chiseled out, and at the same time all of the healthy osseous structure is preserved, that the morbid state will permit.   During the healing process the necessary amount of extension must be made, regardless of the form of the fixation apparatus employed. In the course of two months, the femur will be attached to the acetabular portion of the pelvic bone that will later furnish strong means of support.

The subperiosteal or conservative method of excision of the hip joint (advised by Langenbeck) is executed as follows: the joint is opened by making a straight incision five or six inches in length extending from a point just below the great trochanter and passing upward and backward on a line with the long axis of the trochanter while the leg is flexed to an angle of about 45 degrees, and slightly rotated inward to a point about three inches above the articulation. This incision divides all of the tissue including the periosteum over the great trochanter, and neck of the femur. The edges of the periosteum are raised and dissected free from the neck and as much of the upper end of the shaft as it will be found necessary to remove; the cotyloid ligament is next divided when the thigh is adducted and forcibly rotated outward bringing into view

Fig. 372.—Double wire fixation splint, or breeches, for the immobilization of the hip. See excision of the hip joint.

the ligamentum teres which is severed if found intact, thus liberating the head of the femur which is forced through the incised wound and sawed off. After exposing the acetabulum, if necrotic products are found they are removed with gouge forceps or chisels. This part of the work completed, all bleeding points are picked up and tied, when the deep traumatic opening is flushed out with a 1-3000 bichloride solution and provision made for drainage. The wound is dressed as directed in the previous operation ahd the after treatment should be along the same lines.

Excision of the Knee Joint.

After the surrounding external parts of the knee have been prepared for the operative work, an Esmarch bandage is applied from the foot to a point five or six inches above the knee where just above the last turn of the bandage a rubber tourniquet is tightly adjusted. With the patient under the influence of an anæsthetic and lying upon the back with the leg extended, a curved incision is made across the front of the knee joint commencing at a point on a level with the middle of the inner condyle and ending at a point opposite, the convexity of the flap pointing downward. The incision divides all of the tissues to the bone including the ligamèntum patella about three-quarters of an inch below the patella. The flap, which includes the skin, fat, and fascia, is dissected up from the bone to a point on a level with the termination of the incision. To facilitate the operative work, the leg should be flexed at the knee with the sole of the foot resting upon the table, and supported by an assistant. To completely open the joint the lateral ligaments, as well as the lateral .part of the capsule will next have to be severed which is best done well upon the surface of the femur. If the knee joint be now forcibly flexed the crucial ligaments are exposed and should be cut close to the head of the tibia. care being taken not to let the point of the knife slip into the blood vessels in the politeal space.

After the anterior flap has been well dissected up, and the synovial membrane exposed, if found diseased, it is dissected away with blunt pointed curved scissors aided with thumb forcep. If the membrane is alone the seat of disease, after its removal no further resection is done, otherwise as much of the articular surfaces of the femur or tibia is sawed off as shows evidence

Fig. 373.—Tubercular disease of the knee joint. (*Farnum.*)

of a necrotic state. Often the necrotic tissue is limited to a few small areas upon the ends of the tibia and femur; if so, these patches can be scooped out with a sharp spoon or cut away with a chisel. The general rule of not sacrificing tissue that can possibly be saved holds good in operations upon the knee joint; resection should not be resorted to if a minor oper-

ation will suffice, especially in children, as a loss of either end of the femur or tibia retards the future growth of the bone. In cases requiring resection of the articular ends of the femur and tibia, the patella should be dissected out of its bed by keeping the edge of the knife close to the disk of bone that the adjacent tissue be not injured.

In resection of the articular ends of the femur and tibia, the former is usually freed of soft tissue and forced through the
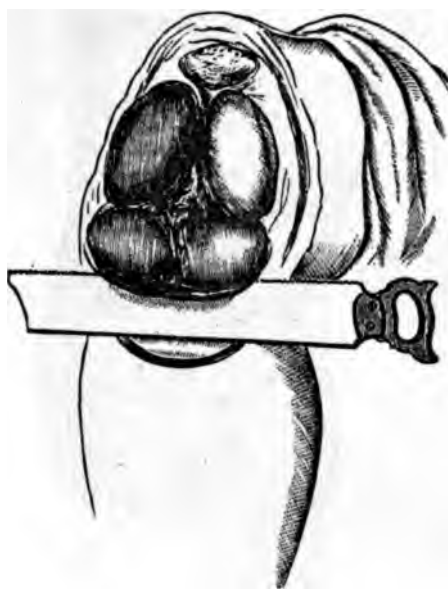
Fig. 374.—Resection of the knee joint. (*Howe.*)

external wound and sawed off first, the hip flexed while executing the work. The tissue is held out of the way of the saw by a slit cloth retractor. The thin section of the articular surface of the femur should be sawed off the same thickness on all sides, that when the end of the femur is later placed in apposition with the denuded end of the tibia and secured, the position will not be that of knock-knee or other deformity. Next the end of the tibia is freed of its soft parts and presented through the gaping wound and the articular surface sawed through as was the end of the femur. In cases where the ends

of the bones are extensively diseased, often three or four inches of the ends are cut away before reaching healthy bone tissue. The necessary amount of the articular ends of the bones having been removed the leg is brought into position, all bleeding points secured, and loose or ragged tissue cut away. Rubber or gauze drainage should be placed well up in the wound cav-

Fig. 375.—Curved incision for excision of the knee. (*Farnum.*)

ity with the ends emerging on either side of the incision. The cutaneous flap is then united with interrupted silk-worm-gut sutures across the front of the knee and the leg then put up in a fixation apparatus, which should either be a long, straight splint or a plaster-of-Paris dressing, very firmly constructed. If the splint is made of the latter the limb is made to assume

the normal position while the plaster is setting. If only a thin portion of the articular surface of the femur and tibia be removed the ends may be brought together and **fixed** by two sutures of silver wire or heavy catgut placed on either side of the median line through holes drilled near the anterior margins of the sawn surfaces of both bones.

Fig. 376.—Result following excision of the knee joint. (*Farnum.*)

After the removal of the rubber tourniquet and before closing the external wound, all oozing of blood should be checked that the plaster cast be not unnecessarily ruined, and have to be replaced with another within a day or two.

The knee-joint may be opened by making an H-shaped incision, as suggested by Volkmann, across the front of the knee and by two lateral incisions. The traverse incision divides the skin and fascia down to the patella at its center, immediately beneath which the bone is sawn

Fig. 377.—Adjustable plaster cast for the knee. (*Farnum.*)

through, and the capsule behind it divided, when the skin flaps should be dissected up, exposing the synovial membrane which if alone diseased, can be dissected out and the wound closed in the usual way, the sawn surfaces of the patella united by two sutures of chromicized catgut or silver wire passed through small holes drilled in the margins of the sawn surfaces

of each half of the bone. This method is advised where the synovial membrane alone is found in a morbid state, especially in early life.

Fig. 378.—*Farnum's* mechanical apparatus for disease of the knee joint.

Excision of the Ankle Joint.

A part or all of one or more of the bones of the ankle joint is frequently removed in attempts to cure caries of the osseous structure, and for relief from traumatic injuries of the tarsal bones. The result of the operative work is not always successful, as the diseased condition often extends to other bones of the tarsus making amputation necessary later on, while in the case of injury the mortality is great and secondary amputation frequently required.

The rule holds good in excision of the tarsal bones in not removing more of the osseous structure than will free the bone of the necrotic patches, ankylosis to a greater or less degree usually follows the operation; the more of the bones saved, the

greater the support to the ankle. To be able to save one or both of the malleoli will contribute much to the support of the ankle besides preventing in a great measure marked shortening.

In diseased states of the bones, especially in tuberculous conditions, the general state of the patient's health should decide for the surgeon as to whether he is to do an amputation or

Fig. 379.—Necrotic disease of the ankle joint. (*Farnum.*)

excision. If the tarsal bones be generally affected, and the patient is anæmic, reduced in flesh, poor appetite, and in general is not in a condition to endure a prolonged convalescence, amputation should be done at once.

Kocher's method of operation, when conditions are favorable, gives very excellent results, and there is much to commend the methods of Konig and Lauenstien. Kocher's meth-

od is executed as follows; after preparing the foot and leg by scrubbing with soap and water, followed with antiseptic washes, a rubber tourniquet is applied above the calf of the leg to control hemorrhage. A curved incision is commenced on the external side of the ankle just behind and below the external malleolus to the extensor tendons well in front. The incision divides the skin, fat, and fascia, exposing the peroneal tendons which are severed and the ends secured with forceps or a strand of silk. The lateral and capsular ligaments are next divided,

Fig. 380.—Line of incision for excision of the ankle joint. (*Farnum.*)

and the foot dislocated inward, the capsule incised and the cavity brought into view and carefully inspected for necrotic patches, which if found are scooped out with a bone curette, or cut away with a chisel. The astragalus is more liable to disease than the other bones of the ankle, and in many cases it is necessary to remove it. If the tibia presents diseased foci they should be cut away, as well as any part of the synovial membrane.

With the diseased tissue removed the cavity may be washed out with a 1-2000 hot bichloride solution and the wound closed; or the wound may be closed by first uniting the peroneal ten-

dons with catgut, then the external wound with interrupted catgut and packed with iodoform gauze. It will be well to apply a plaster-of-Paris dressing to the limb extending from the toes to the knee, and so fashioned while hardening that the foot will be retained at right angles to the leg and slightly everted. Some provision should be made for drainage, and a small section may be cut through the plaster cast over the traumatism to aid in the subsequent dressing. The subsequent dressings will depend upon the progress made in the healing process; if no complications arise the cast can be laid aside by the end of the fourth week, and the after dressings will consist of massaging the foot and making an occasional passive motion to the foot and ankle.

Following the operation the general state of the patient's health should be looked after. If pale and anæmic some potent iron preparation should be alternated with a stimulating peptic. The following prescriptions serve a good purpose in these cases:

R.
Iron, Mur. Tinct. .... ℨ ij
Acid Phos. Dil. .... ℥ ss
Syrup Simplex, q. s. ....fl. ℥ iv
M. Sig.—A large teaspoonful one hour after meals.

R.
Spc. Tr. Nux Vom. .... gtt. x
Elixir Glycero-phos. Lime and Soda .... ℥ vj
M. Sig.—A dessert spoonful in a wine-glassful of water every
three hours.

If the patient be tubercular Fowler's solution can be added to the last compound with good results, or the following formula can be substituted:

R.
Fowler's Solution .... ℨ j
Syrup Lacto-phosphate of Lime .... ℥ vj
M. Sig.—A teaspoonful in a little water every four hours.

Special attention should be paid to the diet, and such appetizing dainties placed before the patient as will stimulate a desire for food. An occasional piece of tender beefsteak properly broiled will prove sustaining, and well cooked fowl, dried beef, eggs, and pickled pigs feet will be taken with a relish.

Custards, jellies, ice cream and lemon or pineapple ice will find a place in the dietary if the patient has occasional hectic states. Of the utmost importance to regaining of the normal state is exercise in the open air; this should be firmly impressed upon the patient at all times.

Excision for Relief of Old Unreducible Pott's Fracture.

A very serviceable ankle-joint has followed operative measures resorted to for the removal of spiculæ of bone and inflammatory products usually found between the astragalus and the internal malleous which may be displaced to a greater or less degree on the inner side, and the removal of all or a portion of the lower fragment of the fibula with bone pliers or chisel. To approach the joint from the outer side, an incision is commenced about three inches above the ankle and carried downward along the front of the fibula and over the malleolus from which point it curves slightly forward and downward to a point over the middle of the cuboid bone as denoted in the cut. This incision divides all of the tissue to the bone including the lateral and capsular ligaments, and periosteum, the edges of which are picked up with dressing forceps and dissected up from the bone with the periosteotome to the point of the old fracture, when with a chisel the displaced fragment is cut away.

A slightly curved incision is then made on the inner side of the ankle following the same course as that on the outer side of the ankle. Upon reaching the joint the inflammatory material, both bony and cicatricial tissue, is removed, and the foot forcibly made to assume its normal relations with the articular surface of the tibia. The edges of the periosteum and divided ligaments are next united with catgut, the bleeding points secured if any present after the removal of the tourniquet, the external wound united with interrupted catgut, with or without drainage, and the ankle immobilized with the foot held in the normal position with splints or a plaster cast.

Excision of the Clavicle

Owing to the close proximity of important nerves to the clavicle, the removal of any consid of the bone in case of caries or other morbid conditi with considerable danger. Before attempting excis: al anatomical relationship of the osseous structure ment of muscles and tendons and nearby bones thoroughly understood.

The patient should be prepared for the ope usual way and placed under the influence of a ; thetic. If the entire bone is to be removed, a longitu is made over its entire length, dividing all of the s including the periosteum. The knife is then laid bone is denuded of periosteum with the perios always keeping the edge of the instrument agains avoid injuring the vessels and nerves. After the l laid bare, it may be removed by dividing it in sectio cutting forceps, or one or the other of the extren separated from its junction with the sternum or the elevator and removed entire. If feasible, the : of the bone should be preserved.

The removal of the clavicle for malignant dise: that are vascular, makes the operative procedure one. With the bone removed, bleeding points a and ligated or secured by pressure, the wound cle and diseased tissue, and closed with catgut sut ample provision for drainage when required. S should be used for dressing, and the forearm shoul ed in a sling. In all cases where the entire bone form of dressing should be adjusted that will hold joint outward, upward and backward not unlike tl fracture of the clavicle.

If only a portion of the osseous structure is to an incision of the required length should be made fected area and the diseased portion removed with saw, or bone-cutting forceps.

EXCISION OF INFERIOR MAXILLA

A portion of the entire lower jaw may be removed on account of disease of the bone, resulting from caries, necrosis, or malignancy.

Before attempting the operation, the anatomy of the bone and its adjacent structures should be well understood that a successful result may not be hazarded by sacrificing contiguous parts.

Malignant tumor of the gums (epulis) often requires removal of a limited portion of the alveolar process, which is accomplished through an incision made along either side of the affected area, dividing the muco-periosteum to a sufficient length, dissecting these structures back from the bone, exposing the diseased portion which is removed with a chisel or bone cutting forceps.

To remove a portion of the body of the inferior maxilla, an incision should be made along the lower border of the osseous structure, dividing the soft structures to the bone; the perios-

Fig. 381.—Lateral half of the lower jaw separated, and forced out of position. (*Howe.*)

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Excision of the Clavicle

Owing to the close proximity of important vessels and nerves to the clavicle, the removal of any considerable portion of the bone in case of caries or other morbid conditions is fraught with considerable danger. Before attempting excision, the normal anatomical relationship of the osseous structure to the attachment of muscles and tendons and nearby bones should be thoroughly understood.

The patient should be prepared for the operation in the usual way and placed under the influence of a general anæsthetic. If the entire bone is to be removed, a longitudinal incision is made over its entire length, dividing all of the soft structures, including the periosteum. The knife is then laid aside and the bone is denuded of periosteum with the periosteal elevator, always keeping the edge of the instrument against the bone to avoid injuring the vessels and nerves. After the bone has been laid bare, it may be removed by dividing it in sections with bone-cutting forceps, or one or the other of the extremities may be separated from its junction with the sternum or scapula with the elevator and removed entire. If feasible, the articular ends of the bone should be preserved.

The removal of the clavicle for malignant disease or tumors that are vascular, makes the operative procedure a hazardous one. With the bone removed, bleeding points are picked up and ligated or secured by pressure, the wound cleared of blood and diseased tissue, and closed with catgut sutures, making ample provision for drainage when required. Sterile gauze should be used for dressing, and the forearm should be suspended in a sling. In all cases where the entire bone is removed, a form of dressing should be adjusted that will hold the shoulder joint outward, upward and backward not unlike that utilized in fracture of the clavicle.

If only a portion of the osseous structure is to be removed, an incision of the required length should be made over the affected area and the diseased portion removed with bone gouges, saw, or bone-cutting forceps.

EXCISION OF INFERIOR MAXILLA

A portion of the entire lower jaw may be removed on account of disease of the bone, resulting from caries, necrosis, or malignancy.

Before attempting the operation, the anatomy of the bone and its adjacent structures should be well understood that a successful result may not be hazarded by sacrificing contiguous parts.

Malignant tumor of the gums (epulis) often requires removal of a limited portion of the alveolar process, which is accomplished through an incision made along either side of the affected area, dividing the muco-periosteum to a sufficient length, dissecting these structures back from the bone, exposing the diseased portion which is removed with a chisel or bone cutting forceps.

To remove a portion of the body of the inferior maxilla, an incision should be made along the lower border of the osseous structure, dividing the soft structures to the bone; the perios-

Fig. 381.—Lateral half of the lower jaw separated, and forced out of position. (*Howe.*)

teum is dissected up, but kept intact, when possible, and as much of the bone preserved as the nature of the case will permit. Every care should be taken to avoid injury to important vessels and nerves, unless the portion of the bone to be removed involves these structures; in this case, the vessels are picked up and ligated as soon as divided. After the necessary amount of the osseous structure is removed, the flaps of soft tissues, including the periosteum are brought back into position and sutured with catgut and the wound dressed antiseptically.

To remove the lateral half of the lower jaw, an incision is made along the lower border of the maxilla, extending from a point within an inch and a half of the zygoma, along the posterior border of the ramus to the symphysis, where this incision is intersected by a perpendicular cut in the lip, extending to the bone. The facial artery should be exposed and ligated before severing it. The maxilla is now exposed by dissecting up the periosteum and overlying tissues and dividing it with a saw in the median line, if the entire jaw is to be removed, and just outside of the attachment of the depressor muscle (genio-hyo-glossus) if only one lateral half is to be sacrificed. The divided end of the jaw is then seized with the finger and thumb, or with a rongeur and forcibly carried outward and downward, dislocating it from its articulation with the temporal bone, at the same time severing with the knife or scissors, the attachment of other retaining muscles and ligaments, carefully avoiding injury to the lingual nerve, by keeping the edge of the knife turned against the bone. To facilitate the enucleation of the condyle from its attachments, the external incision should be extended upward to a point opposite the articulation, carefully avoiding Steno's or Stenson's duct, branches of the facial nerve, and the internal maxillary artery in its position close to the joint; the latter can be avoided only by keeping the enucleating instrument against the bone.

With the bone removed, the bleeding vessels, if any, are picked up and twisted or ligated, the wound cleared of blood with an alkaline antiseptic, the flap returned to its normal position and secured with catgut sutures. The re-dressings are done with antiseptics and sterile gauze.

In cases where it becomes necessary to remove the entire jaw, the remaining half is removed as was the first, being careful not to wound the tongue while severing the mucous membrane along the internal surface of the bone; this can be avoided by holding the tongue to the opposite side by the aid of a long ligature passed through the tip and held by an assistant. Curved scissors are generally used to free the insertion of the temporal muscle from the coronoid process, when it can be readily reached, otherwise the process is severed with bone-cutting forceps and left in position or pulled down with forceps and the muscles severed after the maxilla has been removed. To complete the operation, the flaps of soft tissue are approximated, after hemorrhage has been controlled, and sutured with catgut and dressed antiseptically.

To preserve the symmetry of the soft structures about the lower part of the face, it becomes imperative in some cases, to sever the attachment of some of the more prominent muscles from the periosteum, which should be kept intact, as it is removed from the maxilla. It is also good practice to save as much of the osseous structure as the nature of the individual case will permit, that a slight basis may be formed on which it may be possible to fit a compensatory dental appliance. What has been advised regarding the preservation of periosteum and portions of the maxilla in suitable cases, should not be followed in cases of malignant disease of the jaw, when it not only becomes necessary to remove the entire bone and its covering, but often part of the adjacent structures, especially the glands and tongue. While the traumatic surfaces are healing, the mouth should be frequently washed out with a solution of borax and salicylic acid, twenty grains of the former to ten of the latter, to the pint of water.

Ankylosis of the inferior maxilla sometimes results from cicatrical retraction or adhesions following gunshot and other injuries and extreme ulceration of the buccal tissues, which may extend to the muscles of mastication. Not infrequently the tissues of the cheek become adhered to the gums, forming dense scar tissue, which markedly interferes with the function of the jaw; food cannot be taken, except in fluid form and the pronunciation of certain words is indistinct.

If the morbid state can not be relieved by incising the contracted muscles and mucous tissues, it ofttimes becomes necessary to establish a false joint, anterior to the restraining medium by dividing the bone transversely with a chisel from within the mouth, union of the fragments being prevented by keeping up passive motion between the fragments over the necessary period of time. The morbid condition may be overcome by taking a wedge-shaped piece of the jaw from the upper or lower border of the bone, according to the notion of the operator, and the existing cause of the immobility. To properly execute this operation, an incision two or three inches in length is made along the lower border of the jaw beneath that portion of the bone from which the wedge is to be taken, the bone is bared of periosteum on both sides and then divided with a chain saw, the end of the jaw is then forced outward through the wound and the wedge-shaped section (usually about one-third of an inch) is removed with the saw. The lateral portion is then allowed to spring back into position and the overlying soft structures are closed over it with catgut sutures, with provisions for drainage if needed. The divided ends of the jaw are prevented from uniting by keeping up passive motion for a period of time.

The neck of the inferior maxilla is sometimes divided with a chisel from within the mouth, establishing a false joint by keeping up passive motion until all danger of union between the fragments has passed; after division of the jaw, if the necessary benefit is not obtained, it may be necessary to excise the masseter muscle to lessen the force displayed on the maxillary bone by this muscular structure. When the cause of the ankylosis appears to be located in the articulation, the condyle is often removed through an incision some two inches in length, made along the lower border of the zygoma, extending forward from the tragus. The soft structures, including vessels and nerves below the incision, are retracted downward, exposing the joint, the neck of the bone is freed of all soft tissue, when it is severed by bone-cutting forceps or chain saw and the fragment removed after freeing it from any and all ligamentous and muscular structures. The external wound is then closed in the usual way.

EXCISION OF THE PATELLA

Excision of the patella is sometimes required in traumatism and necrosis of the bone. When practicable, the removal should take place through a longitudinal incision which divides the overlying tissues, including the periosteum, the latter only to the extent of the bone that the synovial cavity be not entered. The periosteum is reflected back with an elevator and the necrotic bone removed, care being taken not to enter the joint, otherwise serious inflammatory symptoms may be set up, eventuating in ankylosis. With no complications following the operative procedure, good results should follow the immobilization of the knee and leg in a plaster cast in an extended position for three weeks or more or until the parts have sufficiently healed to warrant the use of the leg without injury to the wounded area. The wound is cleared of blood and serum with antiseptic washes and closed with catgut sutures, usually without provision for drainage.

EXCISION OF THE PELVIC BONES

The bones composing the pelvis are subject to caries, necrosis, and crushing injuries that ofttimes require the removal of portions of the osseous structures. The nature and extent of the injury to the bone will determine the length and direction of the incision necessary to reach the parts to be removed. The incision divides the soft tissues to the bone, including the periosteum, which is detached with a periosteotome and reflected back, the diseased osseous structure is then removed with a chisel or gouge forceps, all bleeding vessels picked up and ligated, the wound cleared of debris and closed with sutures reinforced with strips of zinc-oxide plaster; sterile gauze pads are applied as dressings, which are held in place with strips of adhesive plaster and over all a bandage can be applied if the case requires it. Drainage should be provided for if necessary.

EXCISION OF THE RIBS

The removal of a portion of the rib is frequently resorted to for the cure of caries, necrosis, malignancy, and gunshot in-

juries. On account of the scant tissue overlying the ribs, they are easily reached through a longitudinal incision made over the diseased area, dividing skin, fascia, and a thin layer of cellular tissue.

If a limited portion of a single rib is to be resected, the length of the lateral incision should correspond to the extent of the diseased area, at each end of which a short transverse incision is made, the portion of the rib to be removed is bared of periosteum and cut away with a wire saw or bone forceps. The intercostal artery, which rests in a groove a little to the inner side of the lower border, should be avoided, if possible; if divided, the vessels should be picked up and ligated or a ligature should be placed around the end of the bone, compressing the artery. With the hemorrhage controlled, the margins of the wound are approximated and secured by catgut sutures and reinforced by strips of adhesive plaster, providing for drainage, if the case requires it.

In cases requiring the removal of a portion of two or more ribs, a vertical incision is made over the diseased area, or the parts to be removed are exposed through a U-shaped flap, dissected up, including all of the soft tissues down to the periosteum, resect the ribs with bone-cutting forceps or fine wire saw, using caution not to enter the pleural cavity, unless the nature of the case makes this necessary. The intercostal arteries are picked up and ligated as soon as divided or they are ligated about the end of the bone. The flap is then re-adjusted and sutured with cat-gut, providing for drainage in the lower part of the wound. Sterile gauze pads are placed over the wound and held in place with strips of adhesive plaster. The chest should then be inclosed with a towel or a many-tailed bandage. Re-dressing should be done as often as the nature of the case requires it.

Excision of the Scapula

The scapula is sometimes removed for the cure of necrosis, malignant tumors and gunshot injuries of the bone. The usefulness of the shoulder is seriously crippled where the entire bone is removed, on account of the attachment to it of the

numerous powerful muscles. To remove the entire bone, the patient is placed under an anæsthetic after the operative field has been antiseptically prepared. With the patient lying on the well side close to the edge of the table, an incision is made from the tip of the acromion process along the line of the spine to the posterior border of the bone. This incision is intersected by another extending from a point near the middle of the first downward to the lower or inferior angle of the osseous structure. The flaps are dissected up from the bone in the several directions from the line of the primary incisions. The attachments of the trapezius and deltoid muscles are severed and the bone then freed from the acromeo-clavicular articulation by severing the ligaments and tendons about the glenoid cavity, being careful not to injure the subscapular artery; if done it should be secured by ligature at once. The muscular and ligamentous attachments about the coracoid process are next divided and the scapula raised by grasping the lower portion of the bone, severing such remaining soft structures as prevent removal of the scapula.

The wound is then cleared of bloody fluids, all bleeding points secured by ligature, the flaps readjusted and sutured with catgut, and dressed with sterile gauze, which is held in place with strips of zinc-oxide plaster. Wounding of the subclavian, subscapular, and posterior scapula arteries and veins may be avoided by observing the rule of keeping the edge of the knife at all times against the bony structure. Drainage may be provided for, if necessary, by placing a small piece of iodoform gauze in the lower angle of the wound, which should be removed by the third or fourth day.

Excision of portions of the body of the scapula may be accomplished, when diseased, by dissecting back flaps of the overlying soft structures through incisions made along the spine or posterior border of the bone and dividing the attachment of tendons and muscles found springing from the necrotic area.

EXCISION OF THE STERNUM

The sternum is subject to attacks of caries, necrosis, and malignant affections, necessitating the removal of a portion or

all of the osseous structure. To remove a portion of the bone, an incision of the required length is made over the affected area, dividing the overlying soft structures, including the periosteum, the margins of the wound are then reflected back with retractors and the diseased portion cut away with gouge forceps, care being taken not to enter the pleural cavity during the execution of the work. The wound is usually dressed without drainage. When removing the entire bone, as much of the periosteum should be preserved as will be consistent with the diseased state of the osseous structure. The wound should be closed with catgut and dressed antiseptically, making ample provisions for drainage. While the wound is healing, the shoulders should be, in a measure, immobilized with a figure-of-eight bandage run on posteriorly, or encased in a plaster-of-Paris cast. The bone is very readily reproduced.

EXCISION OF THE COCCYX

The coccyx is removed when diseased, to facilitate operations upon the rectum, for relief of coccygodynia and the distress following fracture and displacement of the osseous structure forward.

After the overlying integument has been rendered sterile, a linear incision is made over the bony structure, dividing the tissues, including the periosteum, a little above and below the limits of the bony structure. If necessary to facilitate the removal of the bone, a short transverse section can be made at the upper end of the first. The periosteum is then removed from the posterior surface of the bone, which is then disarticulated from the sacrum by dividing the fibro-cartilage with a heavy knife, the coruna are freed from muscular and fibrous tissue and the osseous structure pried out of its position with a bone elevator, snipping with scissors any fibrous tissue that might be attached to its anterior surface. Close the wound with sutures and apply antiseptic dressing. The patient should be kept at rest in bed for two weeks or more or until the wound heals.

PART TWENTY-SEVEN

Lesions of the Female Pelvic Organs

SALPINGITIS

Inflammation of the oviducts, especially of the mucous lining of the tube, is due to traumatism, gonorrheal infection, or septic endometritis following miscarriages and labors. The morbid state is frequently met with among the squalid and poorly nourished, in both the acute and chronic forms, the latter being the most frequently observed.

In the acute form, tenderness and sharp pain are marked features. These symptoms may be confined to one or both sides, depending on whether one or both tubes are affected. Fever, thirst, restlessness and fullness in the fornices of the upper vaginal cul-de-sac are common symptoms of the disease.

In the chronic form, a different train of symptoms are present in connection with a modified form of the acute symptoms. The pain in the region of the tubes is of a dull, dragging nature, worse when standing or walking; the menstruation is often profuse, and attended with more or less griping pain (dysmenorrhœa). The adjacent pelvic tissues are frequently attacked with acute inflammation, obliging the patient to take to her bed for a few days. The tubes become distended with serum (hydrosalpinx) which may later develop into pus (pyosalpinx); if at any period of the affection hemorrhage takes place in the tube, the morbid condition is known as hematosalpinx.

The effusion into the tube causes a marked distention of the ducts until they often assume the size of a small sausage, which they, in some cases, very much resemble, both ends of the tube being closed with inflammatory exudate. Not infrequently the enlarged ducts can be outlined by palpation through the walls of the abdomen. At this stage of the disease tenderness over the region of the tubes and ovaries is very marked. Evacuation

of the bowels excites severe pain and sexual intercourse is prohibited. A condition of absolute sterility exists from the time the ends of the tubes become occluded.

In aggravated cases of salpingitis the uterus becomes displaced to one side or the other, or backward, while the distended tube or tubes assume a position quite well behind it, or become matted close to the side of the organ by inflammatory adhesions.

Treatment. The treatment of salpingitis is by both medical and surgical measures. Great relief, if not a complete cure, may be expected in most acute cases if the patient can be put to bed and kept at rest for two or three weeks on a spare diet, and subjected to antiphlogistic measures. At the outset the bowels should be opened with the salines. Special indications usually call for aconite and gelsemium in sufficiently potent doses to control the fever and in a measure relieve the acute pain. These agents should be aided by occasionally sponging the body with dilute soda water during high stages of fever. In cases resulting from specific or septic infection, vaginal douches of the alkaline solution or a 1-3000 bichloride solution should be given two or three times a day as hot as the patient can endure them. Cloths wrung out of hot water may be applied over the abdomen with the prospect of giving great relief to the pain caused by congestion of the pelvic vessels.

In alternation with the aconite and gelsemium five to ten drop doses of spc. tr. echinacea should be given in water every two or three hours in every case as soon as symptoms of sepsis develop. Avoid giving opiates in any form, except for temporary relief from paroxysms of severe pain. Painting the vaginal vault with tincture of iodine, followed by a cotton tampon soaked in glycerine will often succeed in relieving pain and congestion in chronic cases. The treatment should be repeated every second or third day.

If the ravages of the morbid condition do not give way to the above treatment, thoroughly persevered in for a reasonable time, but seems to grow gradually worse, operative procedures should next be considered, which will consist in breaking up any existing adhesions, binding down the tubes or holding the uterus in a displaced position, and removing the oviducts if

found distended with fluid, and the ovaries if they are found in a degenerated state.

With the patient anæsthetized and prepared for abdominal section, an incision should be made in the median line five or six inches in length, extending down through the skin, fat, fascia, and muscles, till the peritoneum is reached; this membrane is picked up with dressing forceps and divided between them to the extent of the wound in the skin. The intestines are held back out of the way with large sterile pads and the oviducts sought for with the finger. If adhesions are encountered they should be broken up and the tubes and ovaries brought into the abdominal wound, the margins of which are held apart with retractors. After the tubes and ovaries are freed from abnormal attachments, a stout catgut ligature is passed under the ligament at the outer end of the Fallopian tube and ovary with a blunt-pointed aneurism needle and securely tied close to the ovary, the mass included in the loop containing the ovarian artery. Another ligature is passed around the tube and through the broad ligament close to the uterus and tied tightly; the tube is then cut free with scissors, severing the outer end first, being careful to leave stump enough to prevent a retraction of the end through the loop. After the removal of the tube the end of the stump is inspected, and if thought best, an additional ligature may be applied to the severed ends of the artery presenting in each stump. If the tube contains purulent fluid, the end of the stump next to the uterus should be cauterized with pure carbolic acid and wiped dry, before closing the abdominal wound.

The flat sponges, or gauze pads, previously introduced into the abdominal opening, to hold back the omentum and intestines, are now removed; all bleeding points secured, and the abdominal cavity cleared of blood and other fluids. The peritoneum should be closed with catgut and the overlying structures with silkwormgut sutures.

Two or three strips of zinc-oxide plaster should be applied across the abdominal wound to lessen the tension of the sutures, over which a gauze pad should be placed to absorb escaping fluids, which can be held in place with an abdominal binder.

Where the salpingitis is complicated with pelvic abscesses, or the tube ruptures during the process of dissection, spilling

Fig. 382.—Drainage tube in Douglas cul-de-sac, anchored
in position with silver wire. (*Howe.*)

the purulent fluid into the pelvic cavity, drainage will, of neces-
sity, have to be provided for by placing a perforated rubber tube,
surrounded by iodoform gauze down through the posterior vault
of the vagina. The pelvic cavity should be thoroughly cleansed
of pus at the time of operation, and kept as clean as possible by
flushing through the tube, using sterile water or, what is better,
normal saline solution.

The rubber drainage tube should not extend from the vagina
but its lower end should be kept wrapped with iodoform gauze
to prevent, in so far as possible, infection from outside dis-
charges.

Peritonitis is not infrequently a complication met with in
septic conditions of the right Fallopian tube. The appendix is
often found adherent to the diseased tube, necessitating its re-
moval at the same time the operation is performed on the oviduct.
Other complications must be treated as they arise. Should symp-
toms of internal hemorrhage follow the removal of the tubes, one
or more of the abdominal sutures should be removed at the lower
angle of the abdominal incision, and a small sterile gauze pad
fastened on a sponge holder passed down behind the uterus to
determine whether or not such a condition exists. If the blood

is found in a considerable quantity the bleeding vessel should be sought and ligated.

The drainage tube should remain in situ as long as purulent fluid escapes from it: when it ceases, it should be removed by gently pulling on it, at the same time rotating it, to disengage it from adjacent tissues.

UTERINE TUMORS

The uterus, owing to the complexity of its structure, is prone to the development of neoplasms within its texture. These growths are usually fibrous in nature, hence the name fibroid or fibromata. They are benign in character, generally develop slowly, are very hard to the sense of touch, are very vascular and usually inclosed with a capsule of highly vascular connective tissue.

Fibrous growths of the uterus generally originate between the ages of thirty and forty-five, seldom after the menopause and rarely before puberty. The African is more liable to the disease than are white women.

Writers have classified fibrous growths into subperitoneal, interstitial, and submucous, these terms signifying the different portions of the uterine organ in which the tumor has its origin. Fibroids originating beneath the peritoneum near the fundus of the uterus push their way into the abdominal cavity and often attain a considerable size, while the submucous variety develops into a polypoid growth which, taking the course of least resistance, soon emerges from the cervix: the dependent portion becoming clubbed while the pedicle is usually thin and long: however, in some cases, it remains thick and broad. Another form of the submucous variety develops into a globular mass that can be quite readily enucleated. The interstitial growth usually begins deep within the muscular wall and develops in all directions, soon transforming the entire organ into a fibrous hypertrophied mass. It is never multiple although it may be simple in form, and is composed, in all cases, of fibrous intermingled with muscular tissue.

Fig. 283.—Interstitial fibroid of the uterus.   (*Howe.*)

The developing fibroid growth will sooner or later change the form and disturb the functions of the uterus. The menstruation will at times be attended with bearing-down pains and profuse hemorrhages. During these periods the patient is often depressed from nausea and vomiting and the need of proper nourishment; especially are these conditions likely to accompany the submucous and interstitial varieties of the disease. In some respects, the physical symptoms of extra-uterine fibroid simulate ovarian cysts or an abnormal growth of other abdominal organs. In arriving at a correct diagnosis, it will be well to remember that a subperitoneal fibroid generally occupies a position near the median line, is firm on pressure and of slow growth, while the cystic tumor occupies the right or left iliac region, develops rapidly, can be displaced within a certain limit by pressure and is somewhat yielding to the touch.

Polypoid growths, springing from the interior surface of the uterus, often excite contractions of that organ, expelling the polypus and in some cases causing inversion of the womb; in

such cases the inverted uterus has been mistaken for the morbid growth and treated as such. To arrive at a correct diagnosis, it is suggested that a catheter be inserted into the bladder and a finger in the rectum, and by forcing them together it can be determined if the uterus is between them.

Chronic endometritis, changes in the position of uterus, prolapse, inversion, retroflexion and anteflexion, and degeneration of the morbid growth are often present, as marked complications, in cases of fibroid tumors, and such common symptoms as vesical irritability, constipation from obstruction, partial or complete retention of urine, obstruction of the uterus, varicose condition of the veins of the labia and legs; hemorrhoids with more or less disturbance of the nerves of the legs are frequently experienced as a result of pressure of the fibrous growths.

It is not impossible for one or more pregnancies to take place and go to full term during the existence of an intra-uterine fibroid, before it becomes so large that its presence is likely to bring on a miscarriage. The growth of developing fibroids often ceases at the menopause, as the result of a lack of vascular supply, the tumor remaining at a standstill for a time and then becoming atrophied.

The diagnosis of a submucous fibroid of moderate size is comparatively easy. Hemorrhage is an early symptom and varies in degree of severity. Cramping, bearing-down pains, simulating uterine colic, are frequent, and functional derangements of the pelvic organs are manifest when the tumor is of sufficient size to fill the pelvis, producing pressure. The uterine sound reveals an abnormal depth of the uterus, and rectal and bimanual examination of the abdomen determines the enlargement of the organ. With the prominent symptoms of pregnancy absent, the cervix may be dilated and the uterine cavity examined with the finger; if a tumor is present it will present a smooth, rounded body. The examination may provoke active hemorrhage, which may require packing with gauze for a day or two, while the patient is kept at rest in bed.

The interstitial fibroid, however small, will provoke hypertrophy of the uterine organ and, in the absence of internal and external signs of the tumor, the morbid condition will have to be differentiated from malignant disease of the organ. A mi-

croscopical examination of the intrauterine tissue cells will determine the true nature of the growth in most cases.

The uterine sound will reveal the unnatural depth of the womb in a marked hypertrophy of the organ. Hemorrhages are not infrequent, and pain and distress are symptoms due to pressure. The outer surface will present an uneven contour as the disease advances, and the patient sooner or later develops a nervous state of body bordering upon hysteria.

The subperitoneal fibroid of moderate size can usually be determined by abdominal palpation. Their development is generally slow and they are frequently multiple. They usually have a short, broad pedicle, and in those cases where they spring from behind or the sides of the uterus, the pelvis soon becomes entirely blocked by the growth, producing marked pressure symptoms. When the tumor develops near the broad ligaments, the growth will have to be differentiated from cysts of the ovary and tube and extra-uterine pregnancy; from the latter, the diagnosis is the most difficult on account of an occasional menorrhagia, density of the developing walls of the tubal pregnancy, and the tenderness and pain always present in this morbid condition. Palpation of cystic growths will produce fluctuation, hence can be excluded in determining the diagnosis. In this way, other growths may be excluded, such as dermoid cysts, tumors of the spleen, diseases of the omentum, dislocated kidney and vesical tumors.

Treatment. The treatment of fibrous growths of the uterus is by nonoperative and operative measures. The former comprises the local use of electricity to stunt the growth and cause it to shrink, and the local and general use of some potent extract of ergot, administered hypodermically in doses ranging from 10 to 20 minims, or by mouth in slightly increased doses twice or three times a day. The medicinal agent not only checks the development of the growth in many cases, but it will bring about expulsion in the submucous variety in favorable cases.

Prof. A. Jackson Howe advised deep injections into the morbid mass, with a syringe constructed for the purpose, of a drachm or more of tincture of iodine. The instrument is introduced through the cervix after it is thoroughly dilated and into

the depths of the growth. The procedure should be repeated in a week or ten days, if not contraindicated. This potent agent and its method of administration is especially advised in the interstitial variety of fibrous growths; not much pain is experienced, from the deep injection, and the patient is not confined to her bed, following the procedure, for more than a few hours. The surgeon should be sure that the potent agent is properly prepared and the syringe carefully sterilized before administering the drug; also that the uterus and vagina are thoroughly cleansed with a 1-1000 bichloride solution preparatory to the work. During the administration of ergot, its action upon the heart should be carefully watched. as it has a marked depressing effect in some individuals. This can be overcome, however, by giving small doses of nitrate of strychnia in connection with the ergot.

The general health of the patient should be looked after and kept toned up with suitable tonics and nutritious food: nervous conditions should be allayed with sodium or potassium bromide in ten to twenty-grain doses, as may be required. It is also claimed for bromide of potassiun that it reduces fibrous growths when taken in twenty to thirty-grain doses, three times a day, well diluted in water; this action, however, is very doubtful: besides, few patients can tolerate the effect that the drug has upon the stomach and nervous system over any great period of time.

The medicinal treatment of interstitial and subperitoneal uterine fibroids advised in these cases will hold in check the growth. and alleviate many of the symptoms and prolong the patient's life in cases of small tumors, yet the time comes in the majority of these cases when surgical measures alone give the only promise of a radical cure. The success following the latter procedure depends largely upon the experienced judgment and the operative skill of the surgeon. Owing to the improved operative technic in abdominal work, the mortality has been reduced to a very low percentage.

The operative procedure for doing a myomectomy or the removal of a subserous fibroid is briefly as follows: with the patient thoroughly prepared for the work. the abdomen is opened in the median line, the incision extending from near the pubes

upward the required distance. By introducing the hand, a thorough exploration is made and the proper course determined upon. Large tumors may require extending the incision, and existing adhesions must be separated or divided between double catgut ligatures. The intestines are pushed to one side and protected with hot sterile gauze pads. The tumor is then brought up into the abdominal incision and, if it has a distinct pedicle, it should be transfixed with a large needle armed with a braided silk ligature, and tied off either in halves or in quarters and the tumor cut away, being cautious not to cut too near the constricting medium, causing it to slip off the stump as it shrinks, giving rise to active hemorrhage. In cases where the pedicle is very large, or there is none, but the tumor is well defined, the tumor is excised from the uterus after its base is exposed, by dissecting down from the tumor two semilunar peritoneal flaps, the size of which will be determined by the size of the growth and the chasm they will have to span after the tumor has been severed, which is usually done with the finger, aided by strong cutting scissors.

Hemorrhage is controlled by clamping severed vessels as the operative work progresses, the larger arteries being securely tied with silk or catgut and oozing from the small areas, checked by deep circular or quilted sutures passed with a curved needle. After the tumor has been removed the peritoneal flaps are approximated over the stump wound and the edges united with sterile catgut. The gauze protectives are then removed, and all traumatic surfaces once more inspected; if there is no oozing of blood, the abdomen is cleared of fluids and the abdominal incision closed with silk-wormgut in the usual way. Should there be oozing sufficient to justify packing, it should be done with strips of iodoform gauze, one end of which should be allowed to extend through the abdominal incision between sutures left untied till the packing is removed, which can be safely done in twenty-four to forty-eight hours. The incision is then dusted with boracic acid, gauze pads made to cover the wound, which are held in place by a snugly adjusted abdominal bandage.

The interstitial fibroid requires the removal of the womb by abdominal hysterectomy, the technic of which is given in another part of this volume.

UTERINE DISPLACEMENTS

The uterus, a firm muscular organ suspended by ligaments and occupying a position in the center of the pelvis, is subject to displacements which may be due to various causes, the most common of which are a constipated state of the bowels, causing straining at stool, inflammatory disease of the organ and adnexia with contraction of tissue, tight lacing, a relaxed condition of the ligaments, and subinvolution following childbirth.

The abnormal positions which the uterus may assume are prolapse or a sinking of the organ in the pelvic outlet until it rests upon the floor of the pelvis, or it may be found completely outside of the vaginal outlet (procidentia) ; anteflexion, or a bending of the uterus upon itself forward; retroflexion, or a bending of the uterus upon itself backward; anteversion, a forward inclination of the fundus of the uterus while the cervix takes a position backward without flexion of the organ; retroversion, a displacement of the fundus backward where it is usually found pressing upon the rectum while the cervix rests against the bladder.

The causes of prolapse of the uterus are pressure from above of the abdominal viscera, increased weight of the womb with lax ligaments, laceration of the perineum by childbirth, rectal tenesmus caused by constipation, and the wearing of tight and heavy clothing.

The descent of a subinvoluted uterus not infrequently carries the bladder with it, markedly interfering with the function of the urinary organ and that of the rectum as well through pressure. To determine the degree of prolapse, the patient should be examined while standing upon her feet, as the uterus generally assumes its normal position when the patient rests in the recumbent position, except in complicated cases. In complete prolapse, the uterus appears outside of the vaginal walls as a pear-like tumor.

The tiresome backaches, nervous conditions and dragging pains accompanying the morbid state all combine to make the existence of the patient almost unbearable while being obliged to look after her household duties.

Treatment. The treatment of prolapsus uteri will depend largely upon the existing degree and the cause of the displace-

ment. In minor forms of displacement, when due to relaxed pelvic tissues, which condition is usually attended with leucorrhœa, warm vaginal douches of a solution of borax and salicylic acid, geranium maculatum, or witch hazel, twice a day, will give prompt relief. If constipation exists and it is due to digestive disturbances, the diet should be regulated and such articles of food advised as will overcome the torpidity of the liver and bowels. Wheaten grits, graham and whole wheat bread, succulent vegetables, especially onion stew for the evening meal, and stewed fruits, such as raisins, figs and prunes, should be partaken of freely. At the outset, an occasional dose of phosphate of soda, taken in hot water, will prove effective. Tight lacing and the wearing of heavy skirts girted about the waist should be discouraged. Much walking while under treatment should be avoided, as well as lifting and other strenuous work. If the uterus is found to be increased in weight, subinvoluted hot douches of salicylic acid and borax will do something towards a cure. Of special benefit will the following solution prove in these cases, when painted about the cervix uteri and applied to the endometrium with a cotton swab every second or third day, while the uterus is kept in position with a cotton tampon moistened with fluid extract of ergot or equal parts of witch hazel and glycerine:

R.
　Iodine Crystals ....gr. xx.
　Potassium iodide ....gr. xl.
　Alcohol ....fl. ℥ j.
　M. Sig.—For local application as directed above.

In cases of prolapsus of a more pronounced degree, due to perineal lacerations and pronounced relaxed and other senile changes, the same advice regarding conditions of health, diet and dress, should be observed, and in connection, a suitable pessary or tampon should be worn after the uterus has been replaced, if operative measures are refused. Large tampons made from medicated cotton or wool make an excellent support to the uterus after it is replaced, and can be more comfortably worn than the hard rubber pessary. It should be explained to the patient that this form of treatment gives only temporary relief, and that a cure can only be presumed by a resort to surgical measures.

which takes the nature of a perineorraphy, shortening of the round ligaments, ventro-fixation and anterior and posterior colporrhaphy in women past the age of childbearing.

To execute a perineorraphy the patient should be prepared by clearing the bowels by some one of the saline purgatives, borax bath, and by vaginal douching. Instruments that the surgeon should have at hand are a scalpel, scissors, several small hemostats, dissecting forceps, Sym's speculum, needles and needle-holder, retractors, catgut and silk-wormgut suture material.

The patient should be placed under a general anæsthetic and in the lithotomy position, the torn surfaces should then be denuded of scar tissue, placed in apposition and secured by numerous silk-wormgut sutures deeply placed. The wound is sponged with some antiseptic solution and dusted with antiseptic powder over which a sterile gauze pad should be placed and secured with a T-bandage. The patient should be kept at rest in bed for two weeks and the urine drawn with a catheter two or three times during the twenty-four hours for two or three days following the operation. The sutures may be removed in ten to twelve days, and with no complications arising the parts should be healed in two weeks.

If the case of uterine prolapse is one in which a colporrhaphy operation is feasible, it should be done as follows: after douching the vaginal outlet well with antiseptic solutions, an oval section of tissue of sufficient size to overcome the extreme laxity of the walls should be removed from the anterior portion of the outlet, the margins of the wound approximated and sutured with catgut. The external parts are then cleared of bloody fluids and dusted with borax and salicylic acid and dressed with a perineal pad held in place with a T-bandage. The patient should be kept at rest in bed for ten days to two weeks.

A ventrofixation or suspension of the uterus to the anterior abdominal wall is frequently resorted to for relief, not only from extreme cases of prolapse, but for other extreme deviations of the uterine organ, such as retroflections and retroversions. The operation is done as follows: After the patient is prepared in the usual way and anæsthetized, an incision two or three inches in length is made in the median line over the uterus. The peri-

toneum is picked up with thumb forceps and divided to the full
extent of the external incision, the edges are grasped with artery
forceps and pulled well out of the abdominal wound, where it is
held by assistants while the sutures are placed through the
fundus of the uterus and folds of the peritoneum on either
side, after the womb has been freed from adhesions, if any exist,
and brought up into the ventral incision. Two sutures of silk
or fifteenday catgut will suffice to hold the uterus and peri-
toneum in contact, when properly tied, until their surfaces be-
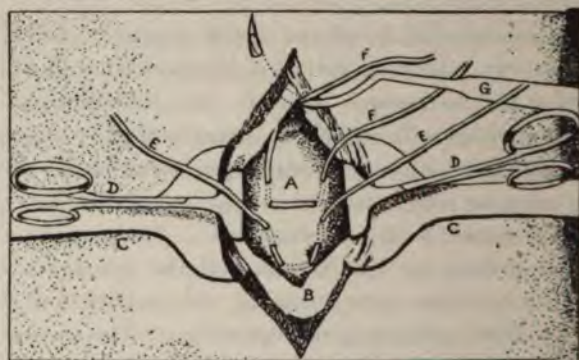
Fig. 384.—Suspension or fixation of a prolapsed kidney.
A, the kidney; B, the fatty capsule dissected back; C, C,
retractors separating margins of lumbar incision; D, D, the
forceps grasping and drawing out fatty capsule; E, E, the
first or lower sustaining suture; F, F, second sustaining su-
ture; G, curved needle, in a long handle, carrying end of
suture from within outward through the structures of the
back at upper angle of the wound.

come firmly adhered. (See Cut.) The operator should be care-
ful not to include a loop of intestine or section of omentum be-
tween the uterus and abdominal wall when tying the sutures.
The peritoneum is then closed with a continuous catgut suture
and the muscular walls, including the skin, closed with inter-
rupted silk-wormgut sutures. The wound is then dusted with
antiseptic powder, a sterile pad adjusted and held in place with
strips of adhesive plaster, and over all an abdominal binder
should be applied.

If in the absence of adhesions and disease of the uterus,
tubes, or ovaries, the uterus still maintains a retroposed position,
much benefit is derived by replacing the organ in its normal po-

sition and securing it there by shortening the round ligaments (Alexander's operation) ; even in this form of displacement, it is only those cases that give rise to symptoms that make it necessary to resort to this form of operation.

The patient is prepared as for ordinary laparotomy and given ether or chloroform. An incision two inches or more in length is made along the line of the inguinal canal about one-half inch internal to Poupart's ligament, dividing skin, fat and fascia down to the external abdominal ring and to a point near the spine of the pubes. By separating the fatty tissue found in the canal with the point of a grooved director, the round ligament, which is often attenuated in size, may be fished up by the aid of a blunt hook and pulled out of the external wound three inches or more, but in order to accomplish this feature of the work, it may be necessary to elevate the uterus with a sound while traction is gradually made upon the ligaments. In cases where the ligaments are very small it will be necessary to open the inguinal canal by incising the aponeurosis of the external oblique muscle upon a grooved director and dissecting up the ligament which is often bound down to the surrounding tissues by adhesions.

With one ligament exposed and drawn out of the wound, it should be held with forceps while the opposite ligament is secured by the same operative procedure as was the first. While the ligaments are held in their new positions they are made fast to the pillars of one or both inguinal rings with catgut, as the case may require. The incision in the intercolumnar fascia is then closed with fine catgut, likewise that in the aponeurosis of the external oblique, if that sheath has been divided, and the remainder of the abdominal wound closed with silk-wormgut, dusted with boric powder and dressed with sterile gauze compresses and a binder applied. If the work is done by observing strict antiseptic precautions, drainage need not be provided for. It will be well to maintain the uterus in an elevated position for a month or six weeks by use of vaginal tampons made of medi-cated cotton-wool.

The patient should keep her bed for three weeks, at the end of which time the wound should be healed.

As the treatment of anteflexion and anteversion of the uterus differs somewhat in detail, the surgeon should make a differ-

ential diagnosis at the outset of the two malpositions. In ante-flexion, the uterus is bent upon itself at a point about on a line with the internal os. A digital examination will locate the cervix resting in the axis of the vagina, but somewhat higher up than usual; the os is usually found pointing forward, and as the finger is passed upward on the anterior surface, a sulcus will be noted at the point where the organ is bent upon itself. The fundus will be found resting against the bladder or above it and has been mistaken for a fibroid. Any attempt to introduce a sound will meet with an obstruction at a point a little above the internal os, and if adhesions exist between the fundus and the posterior wall of the bladder, the malposition will still remain with a distention of the latter organ.

As before stated, in anteversion the fundus of the uterus lies against the bladder and on the anterior vaginal wall. The cervix is found pointing backward and rests near the hollow of the sacrum, and when pulled downward and forward the passing of a sound may be accomplished without hindrance, as there is an absence of flexion.

The most prominent symptoms of anteflexion of the uterus are pelvic pain, leucorrhœa, dysmenorrhœa and in pronounced cases, sterility.

The usual symptoms observed in anteversion are pelvic uneasiness from congestion, frequent desire to urinate, caused by pressure of the fundus against the bladder, and menstrual irregularities.

In the absence of adhesions, the deviations may be corrected by the use of the sound, aided by bimanual manipulations. Once the uterus is replaced, an effort should be made to maintain it in its normal position by the wearing of a vaginal tampon made of medicated wool, or a pessary fashioned to meet the requirements of the individual case. The wool tampon is recommended only in marked cases of lax tissues, especially those of the vaginal walls; the plug of wool texture can not hold a flexed uterus in an upright position, even after it is once replaced.

If the uterus is hypertrophied through congestion or metritis the organ should be depleted by hot vaginal douches, hip-baths and the application to the cervix of the following mixture:

℞.
    Iodine crystals .... gr. xx.
    Potassium iodide .... gr. xl.
    Glycerine .... ℥ j.
M. Sig.—Apply to the uterine cervix once a day on a cotton
    tampon.

If constipation is a feature of the deviation, it should be corrected as well as other functional wrongs that may have a bearing upon the morbid state of the uterus. .

If the uterine mucous membrane is puffy and thickened from chronic metritis, the cervix should be dilated, the uterus washed out with a warm solution of salicylic acid and borax or carbolic acid, after which a curettage should be executed with a dull spoon curette and the cavity again irrigated and packed with iodoform gauze which should be left in place two or three days; after its removal the uterine cavity should again be irrigated with a warm boric solution.

An enlongated or hypertrophied cervix should be amputated, as by this operation the uterus is not only relieved of its weight, but atrophy of the body of the organ frequently follows its removal. The successive steps in the operative work are as follows: After rendering the vaginal outlet sterile by douching with warm bichloride solution, 1-3000, followed by normal salt solution, and with the patient under the influence of a general anæsthetic, the cervix is exposed with the aid of Sim's speculum and grasped with volsellum forceps and pulled well out of the vulva; while it is held in this position, a circular incision is made through the vaginal wall, at the point where it is reflected upon the uterine neck; the knife is then laid aside and, with the thumb nail, the margins of the vaginal incision are dissected upward, both anteriorly and posteriorly, care being taken not to injure the bladder by keeping the thumb nail or handle of the scalpel directed at all times against the cervix. If in doubt regarding the location of the bladder, a sound inserted within the viscus will determine its relative position to the uterus. As the uterine vessels are approached, a ligature should be thrown around them on either side close to the cervix with a curved needle and securely tied, silk or strong catgut being used for the purpose.

By keeping well against the cervix during the dissection, entering the peritoneal cavity will be avoided.

After the cervix has been denuded to the extent of an inch and a half to two inches, it is split in halves from its external end back as far as the denudation extends. Then the margin of the incision in the anterior vaginal wall is united to the anterior cervical lip with a strong catgut suture placed with a curved needle a little below the upper angle of the slit and made to include the mucous membrane of the cervical canal. A similar ligature is placed through the posterior margin of the vaginal wound and posterior cervical lip, including the mucosa of the cervical canal, as was the first. A number of other sutures are then placed both anteriorly and posteriorly and each section of the cervix cut away, being careful not to divide the tissues too close to the ligatures. The ligatures are now tied, bringing the mucous membrane of the vagina in contact with that of the cervix. The open spaces in the vaginal vault on either side of the cervix are then securely closed with catgut, including any existing bleeding points within the loop when tying. The wound and vagina are next cleared of bloody fluids with antiseptic washes and lightly packed with sterile lint or cotton, which should be removed at the expiration of twenty-four hours and repacked if necessary. One of the greatest postoperative dangers is the formation of pocket abscesses, which should be anticipated by the surgeon and, if such a condition is discovered, the purulent fluid should be promptly evacuated.

VAGINAL NEOPLASMS

Tumors composed of muscular and fibrous tissue sometimes originate in the walls of the vagina, although they are extremely rare. They occur more frequently in women between thirty and forty than at earlier or later periods, although these growths have been observed in early life and in old age.

The etiology is somewhat obscure, but the cause is thought to arise from a local infection or morbid cell growth, resulting from local inflammatory action.

They are benign in character, develop somewhat slowly, and produce symptoms in character and severity proportionate to the size of the growth and its location. Growths of large size obstruct the vagina and pelvis, causing marked pressure symptoms, such as irritation and tenesmus of the bladder, with more or less retention when the urethra is encroached upon, a sense of weight in the pelvis, constipation, rectal tenesmus, accompanied by pain and hemorrhage in some cases, and leucorrhœa. Cases are on record where the tumor, owing to its great size, interfered with delivery.

In form these growths may be sessile or polypoid, the most of them being of the latter variety, and are usually simple. After attaining a certain size, there is a tendency to necrosis, ulceration, and œdema of the adjacent parts, accompanied with a profuse leucorrheal discharge, very acrid and irritating in character.

Treatment. The treatment is essentially along surgical lines. Attempts to reduce these growths by electrolysis, or by injecting them with caustic drugs, have availed but little.

The polypoid growths are removed by dissecting the mucous membrane back from the base, cutting the tumor away even with the surrounding tissue; bleeding vessels are picked up and ligated. If the base is thick, it should be transfixed with a needle armed with a silk ligature, and tied in halves, close to the tissue plane, and over the stump the previously reflected mucous tissue is approximated and secured with catgut sutures.

Sessile growths are removed by incising the overlying mucous membrane and fascia, reflecting it back and enucleating the growth with the finger, if possible, aided by snipping dense and tough fascia with scissors. To reach these tumors, when they spring from the upper portion of the vaginal canal, it may become necessary to enlarge the vagina by making lateral incisions. After removing the growth, and all hemorrhage controlled, the margins of the vaginal wound should be closed over the cavity. Following the operative work, the vagina is kept packed with sterile bichloride gauze for five or six days, and longer if existing conditions require it.

Tumors of a malignant character are also likely to be found in the vaginal walls; these comprise sarcomata and carcino-

mata. The former appears in early life, usually in a polypoid form, while at later periods it manifests itself in a more diffuse growth. The latter is found in any portion of the vagina, and usually develops rapidly, especially if it is secondary to sarcoma of the uterus. The polypoid form is rather slow of growth, and has a tendency to undergo necrosis after attaining a certain size. The diffuse sarcoma, after a time, breaks down and rapidly degenerates into a necrotic mass, giving use to a profuse, foul-smelling discharge. The ulcerated surface soon becomes infested with pyogenic germs, which cause rapid destruction of the diseased area, and often hastens a fatal termination of the patient's life. Functional wrongs of the pelvic organs soon become manifest, seriously affecting the patient's comfort; aggravating cystitis being the chief complaint. Pain, tenderness, rectal and vesical tenesmus are symptoms in common, in advanced stages of the morbid state; also pyelonephrosis and suppurative peritonitis.

A true diagnosis is made by a microscopical examination of scrapings of the growth, which should be done early in the course of the disease, that radical measures may be taken before the disease spreads to the other pelvic organs.

The treatment is by removal of the growth by surgical measures. The operation must be thoroughly done, removing the uterus also, if it is found to be in any degree affected. The state of the individual case will determine whether this be done through the vagina or by abdominal hysterectomy; as the technic of these operations has been given in another part of this work, it will be omitted here.

Following operative measures, the general health of the patient must be put in the best of condition; anæmic states will call for tonics and stimulants, while digestive disturbances will require the use of the digestive ferments, rich nutritious foods given at regular intervals and in quantities to meet the requirements of each individual case.

Carcinoma of the vagina is not a common affection, especially of the primary origin. It has been estimated that about one per cent of all cases of cancer occurring in women are of vaginal origin. It appears usually in the upper portion of the vagina, secondary to cancer of the uterus, either as a fungus

mass of tissue, bleeding freely when its surface is touched, or as a sloughing ulcer, with hard and infiltrated edges.

It is claimed by medical men high in authority that trauma following childbirth, and heredity, are etiological factors responsible for the malignant disease, while others of equal clinical experience cite the fact that so small a percentage of cancer observed in the vaginal walls, as statistics show, can hardly be traced to traumatism, for should this be true, such cases would increase in number, for few parts of the body are subject to greater irritation from various causes than the vagina.

Carcinoma, under some conditions, develops very rapidly and soon breaks down with ulceration, accompanied by the train of symptoms characteristic of the malignant disease. The pelvic lymphatic glands soon become involved, enlarge, and soon break down with suppuration; a foul-smelling, watery discharge comes from the diseased area, defecation and the voiding of urine are difficult and painful, hemorrhages now and then occur the patient becomes markedly enæmic and soon dies from exhaustion, the average length of time for the disease to run its course being about sixteen to eighteen months from its first appearance.

In establishing a diagnosis, it should be done with the understanding that the probabilities are that the disease has become seated in the uterus or other pelvic organs, the vaginal manifestation being of secondary origin.

Th treatment of carcinoma of the vagina is by resorting early to surgical measures in all cases where the involvment of adjacent organs does not contraindicate it. This is determined by estimating the extent of fixation by palpitation, and examination of the adjacent parts through the rectum with the finger.

The location and character of the malignant growths should determine the course of the operation in all cases. Small tumors can be removed by a simple incision through the vaginal outlet, dissecting away the growth with scissors, keeping outside the diseased area by a margin of half an inch or more; after removal of the growth, the margins of the wound are brought together and secured with catgut sutures.

More extensive phases of the disease will require incising

the vaginal walls, enabling the operator to easily reach the diseased area, which is cut around with knife or scissors and turned out by blunt dissection. If the incision is made in the posterior wall of the vagina and extending back through the perineum care should be taken not to wound the rectum; to avoid this the bowel should be displaced to one side with retractors after exposing it, giving an opportunity of executing the work from the posterior part of the vagina with ease. By this method, a portion or all of the cervix may be removed, if found involved in the cancerous growth, and it usually is in cases originating in the upper portion of the vagina. In freeing the diseased cervix from its surroundings, the surgeon should exercise care not to open the peritoneum or wound the bladder, which lies in close proximity in front.

MALIGNANT DISEASES OF THE UTERUS

The uterus is frequently the seat of the various phases of cancer and sarcoma. The malignant disease is not observed as often in early womanhood as it is about the climacteric period. The disease may attack any part of the genital tract, but the vulva and cervix uteri are the most likely to suffer from the invasion of the devitalizing malady.

The disease runs a more rapid course, and the percentage of fatal cases is greater in early life than it is at a later period. This may be accounted for, perhaps, by the fact that most of the former cases have a hereditary history.

Women who have borne children are more likely to have malignant disease of the uterus than are those who remain unmarried. If the nature of the disease is not determined during its incipient stage and the organ removed, the adjacent organs are likely to become involved, soon cutting short the life of the patient. Not infrequently are the bladder, rectum and other pelvic structures involved in one mass of malignant disease, presenting conditions from which there is no relief.

Soon after malignant disease makes itself manifest, the general health of the patient begins to suffer from its devitalizing effect. Irregularity of the menstrual function is one of the early symptoms; pain and distress increase as the disease advances.

The features are pallid and the patient complains of increasing weakness. The appetite becomes variable, digestion poor and the bowels bound up or occasionally alternated with a diarrhea; within a year or more following the primary attack the patient becomes vitally depressed, loses flesh rapidly, and soon dies from anemia.

Surgeons of experience claim that the cervix is likely to be attacked with the epithelial form of cancer, and the body of the uterus with the encephaloid variety of the disease, while the scirrhous cancer may attack any part of the organ and adjacent tissue.

During the early stages of the disease the infiltrated tissues feel hard to the sense of touch, but soften somewhat as the disease advances; besides, the pelvic space is seriously encroached upon by the developing growth. During the stage of degeneration. the bladder, uterus and rectum may become broken down and converted into one suppurating cavity, discharging purulent matter together with the normal excretions of these organs.

From what has been said regarding cancer of the uterus, a diagnosis should not be clouded with uncertainty. The local pain and distress, the pale and pinched features, the gradual loss of flesh, the hardness of the uterine tissues, the foul-smelling watery discharges, all point to malignancy. As to the differentiation between cancer and sarcoma of the uterus, a difference may be noted in the shape and form of the cells composing the growths; besides, sarcoma develops more rapidly than cancer but in many respects the malignant growth resembles that of carcinoma.

Treatment. To fortify the system against the invasion of malignant disease, the best of health must be established and maintained, to increase the resisting powers of the body. Outside of peptics and tonics to stimulate the vitality of the system not much good can be expected from medicinal agents in the treatment of the morbid state. Several private formulas have been used by deep injections into the diseased mass, with the purpose of staying the progress of the disease, with only temporary benefit. For this purpose, ten drops of a five per cent solution of salicylic acid in alcohol or glycerine should be in-

jected into two or three different parts of the growth, at one sitting, and should be repeated in a week or ten days, Pyoktanin in two to three grain doses, administered hypodermically, has benefited some cases in the surgical service of Lewis and Boldt. Sterile alcohol has been used with some degree of success, when injected into the depths of the indurated tissues. It causes a hardening and later a separation of the diseased tissues. Refined petroleum is recommended by Despres, used in the same manner; he claims that the remedy brings about a speedy separation of sloughs, while at the same time it causes a dessication of the diseased tissue. These agents and the method of administration are painful and are only resorted to in cases where other measures are contraindicated or refused.

Curettage, followed by the topical application of chloride of zinc or other active caustic, is recommended in advanced cases of the disease. This method rapidly disposes of the diseased tissue, but can do no better than delay the progress of the disease for a short time. In the application of the caustic, great care must be taken not to burn the adjacent vaginal walls. The actual cautery is made use of for the same purpose, and in the hands of the experienced operator will soon dispel the exposed cancerous mass.

The odor emanating from a bad case of cancer of the uterus is extremely disagreeable, and should be overcome with active deodorant agents. Frequent vaginal douches of asepsin in hot water, or two per cent permanganate solution, serves a good purpose here, as does a powder composed of the following remedies:

R.
   Asepsin ....$\bar{3}$ iij.
   Magnesia Carb ....$\bar{3}$ ij

M. Sig.—Local dusting powder, or

R.
   Benzoin ....$\bar{3}$ ij.
   Iodol ....$\bar{3}$ j.
   Powdered pearl starch ....$\bar{3}$ j.

M. Sig.—Dust on the cervix uteri with a powder blower after douching and drying the ulcerated surfaces.

To subdue pain, an occasional suppository, composed of the following agents, may be relied on. It had better be used at bedtime, as it will insure a good night's rest:

℞.
    Ext. Hyoscyami ....
    Ext. Cannabis Indica, āā ....gr. ij.
    Codeine ....gr. x.
M. Sig.—Make twelve suppositories.

The amount of the ingredients can be increased as the patient becomes habituated to their narcotic effect.

In the worst phases of the disease, an occasional hypodermic injection of morphine, codeine, heroin or Abbott's H. M. and C. tablet, will be demanded to give relief, if only for a short period of time.

At all stages of the disease the vitality of the patient should be kept up by the constant use of tonics and stimulants associated with a nutritious diet. Early in the morbid condition arsenic, lime, iron and pepsin will produce good results, if given in alternation, but will accomplish little good in the latter stages of the disease.

A favorable prospect of a cure lies in determining the true nature of the disease early, and the removal of the uterus by the vaginal or abdominal route. High amputation is sometimes done when the disease seems to be confined to the cervix, with varying degrees of success, but the operation does not give the percentages of cure that complete hysterectomy does.

Vaginal hysterectomy is a safe procedure, and is executed as follows: After the parts are antiseptically prepared,. the patient is catheterized and placed in the lithotomy position. The cervix is exposed by holding the vaginal walls apart with retractors and is grasped with volsella forceps and the uterus pulled well down, while the mucous membrane is incised with a scalpel, or divided with scissors, an inch or more from the end of the cervix. By blunt dissection with the handle of the scalpel and the forefinger, this structure and underlying fascia are separated from the body of the cervix anteriorly and posteriorly until the uterine artery is reached. These vessels can be located by feeling them pulsate. The utero-vesical fold is next separated from the uterine body with the end of the finger at the point where it is reflected upon the uterus. If much hemorrhage follows, this opening should be packed with small pads of sterile gauze. Posteriorly, the mucous membrane and cellular tissue are dissected up until Douglas' pouch is entered and the opening en-

larged sufficiently to permit of the fundus of the uterus being delivered into it by hooking the finger over it and pulling it down, thus bringing within easy reach the broad ligaments, which are clamped with long forceps and divided on the uterine side with long scissors, care being taken during the execution of this work not to injure the ureters. This is done by pressing the urinary ducts forward with the anterior layer of the broad ligament and exercising caution in applying the clamp forceps not to take too wide a bite.

If thought best, the clamp can be left in place for forty-eight hours, and around them and in the wound, sterile gauze may be placed to prevent infection, if possible, but in cases where the broad ligament tissues are healthy they should be tied with a braided silk ligature, the wound cleared of clots and the margins approximated and secured by two or more catgut sutures, leaving, if necessary, room for drainage. The vagina is then packed with sterile gauze which should be removed the second day and repacked, after douching with bichloride or other antiseptic solution. Where the cancerous growth has involved the tubes and broad ligaments, which condition is usually complicated with extensive adhesions, abdominal hysterectomy is the safer operation to adopt, although a portion of the work is done through the vagina, making the operation a combination of the two methods. The operative technic is along the following lines: After placing the abdomen and vagina in an aseptic condition, the patient is placed in the lithotomy position. The vaginal walls are held apart with retractors, exposing the cervix, which is grasped with volsella forceps and the uterus pulled down within reach and the mucous membrane and fascia cut clear anteriorly and posteriorly of the cervix, as in vaginal hysterectomy. The dissection is continued up in front and behind the cervix, with the end of the finger, until the uterine arteries are reached; if portions of tough membrane and inflammatory adhesions are encountered they should be snipped with scissors. The uterine arteries are located by their pulsation, felt between the thumb and finger. A braided silk ligature should next be passed around each artery with a curved needle and securely tied, after which the vessels are severed on the uterine side with scissors, care being taken not to cut so close to the ligature as

to endanger it slipping off. The open wound is temporarily packed with sterile gauze, and the position of the patient changed to that of Trendelenberg, and the abdomen opened by making a median incision eight inches or more in length extending upward from a point near the pubes. The intestines are displaced from the pelvis and covered with hot sterile gauze pads and the uterus brought into view, if possible. The tubes and ovaries are carefully examined with a view to their removal. The outer end of the broad ligaments are next exposed and divided between a double ligature, passed with an aneurism needle, using silk in preference to catgut. The tubes and ovaries are then freed from their attachments by a few snips with scissors, keeping close to these organs. The uterus is then pulled up well into view and the peritoneum and cellular tissue divided transversely on a line with the utero-vesical fold, executing the work with scissors, cutting toward and keeping close to the uterus, to prevent injury to the bladder, ureters, and other adjacent structures. If extensive adhesions are encountered, they must be carefully torn loose or divided between double ligatures. The uterus removed and the pelvis flushed with sterile saline solution, the ligatures should be critically inspected to guard against their slipping off, giving rise to serious post-operative hemorrhage before closing the abdomen, which is done with catgut or silkwormgut, preference being given to the latter.

Before closing the abdomen, the margins of the peritoneal flaps cut from the uterus should be approximated, and two or more sutures of catgut taken with or without provision being made for drainage; the condition of each individual case should determine the necessity of this measure at the close of the operative work.

If the malignant disease has not spread to the tubes, ovaries and broad ligaments, they should be divided at the inner or uterine end between a double ligature of silk, if thought best, and after the uterus has been cut away it is a safe practice to pick up the ends of the ovarian arteries and ligate them independent of the first ligature placed, to insure against hemorrhage.

Throughout the operative procedures, care should be taken to prevent, if possible, contamination of the pelvic tissues by surrounding the diseased organs with sterile gauze pads and

flushing the pelvis thoroughly with sterile saline solution before closing the abdomen. Shock in serious cases must be guarded against by the timely administration of strychnia, digitalis, and whiskey, and keeping the patient warm by placing hot-water bottles beneath the woolen blankets that are wrapped about her. It is good practice to give a rectal enema of hot normal salt solution before the patient leaves the table, in cases where the operation has been prolonged. The operations advised in carcinoma of the uterus will apply to cases of sarcoma of that organ; here, as in cancer of the uterus, a correct diagnosis should be determined early and the enucleation thoroughly done to insure against recurrence of the disease.

PERINEORRAPHY

Perineorraphy is the closure of a lacerated perineum by surgical measures. If the rupture is a slight one, a half inch or so in depth, one or two sutures, taken rather deep, will suffice to close the rent, whether it is taken immediately following the tear or at some subsequent period, after paring away the scar tissue. Ruptures that extend to the rectum and even into the bowel may be successfully closed at once following the tear; the traumatism will require six or eight sutures and even more, depending upon the nature of the laceration and the method chosen for its repair.

If the laceration is not mended within the first twenty-four hours following the injury, it had better be left for a month or two, or until the tissues involved have lost their swollen and puffy condition, when, after removing the scar tissue, the margins of the wound can be brought together and fixed with silk-wormgut sutures, eventuating in a successful operation if properly done and no complications arise.

The repair of a complete perineal laceration by the operator who has had but little experience in this line of work, will not find its execution as easily accomplished as the directions given in works on surgery would lead him to believe. After the separation of muscular structures, they retract from the median line, becoming fixed in their abnormal position, presenting a wide

chasm to the traumatic area, and after denuding the torn surfaces of scar tissue and in other ways preparing the parts involved for suturing, it is somewhat difficult to make the traumatic field conform to the views of like operations presented in many of our text-books.

A common cause of failure to obtain a union of the margins of the vaginal wound is infection from the vaginal discharges or the seepage of urine within the limits of the traumatic surfaces.

To prepare the patient for the operation the bowels should be thoroughly moved with the salines, the bladder emptied previous to going to the operating room, and the vaginal canal thoroughly cleaned with bichloride solution, 1-3000, followed by a normal saline douche. The period for operation should be chosen about ten days after menstruation, and the patient should be in fair condition.

The operator should have at hand a scalpel, straight and curved scissors, dissecting forceps, Sim's speculum, a half dozen hemostats, retractors, curved needles and needle-holder. As the object sought is to restore the vaginal outlet to its normal condition, only the cicatricial tissues require removal, so that when the denuded surfaces are brought together a normal perineum will be restored.

The patient should be anæsthetized and placed in the lithotomy position with the thighs well flexed upon the body. The denudation of scar tissue should commence at the outer edge of the septum, the latter being split each way from the median line, exposing the ends of the sphincter muscle when this structure is separated. The dissection gradually extends upward, reaching down into each vaginal sulcus, if such is found to exist, exercising due care that no part of the scar tissue is left behind. When the denudation has been completed, the raw surfaces are brought together and secured with silk-wormgut or fifteen-day catgut. The number of sutures required will be determined by the nature of the tear to be repaired. In placing the sutures, the sides of the vaginal outlet should be well retracted, that the raw surfaces may be well brought into view. The upper sutures are placed first, entering the needle about one-fourth of an inch from the raw surface, bringing it out in the bottom

of the wound; if necessary, re-entering it at the same point, it is made to traverse the tissues on the opposite side, emerging at a point on the mucous membrane quite opposite to the point of entrance. The remainder of the sutures are placed in like manner. The upper sutures are tied first and those including the skin in the perineum last. In cases where the sphincter muscle has been torn, the denuded ends should be included in two of the sutures and tightly brought together. The vaginal

Fig. 385.—The placing of silk-wormgut sutures in the repair of an incomplete rupture of the perineum, after denudation of the traumatic surfaces.

sulci, when they exist, should be repaired separately; fifteen-day catgut should be used here instead of silk-wormgut, although there is no objection to the use of the latter, which are easily introduced after they have been immersed for a few moments in hot water. They may be left in situ for two or three weeks without exciting irritation. Care should always be taken not to enter the rectum with the needle when placing the sutures.

Where the tear is complete, the rent in the bowel should first be closed with catgut sutures, placing the one in the upper angle first and tying, the remainder being introduced about

three-eighths of an inch apart, tying each one as it is introduced. It usually requires from five to six sutures, and in extreme cases even more, to bring the margins of the torn bowel into its normal position. These sutures are placed by entering the needle on the rectal mucous membrane near the margin of the wound, emerging on the raw surface and re-entering the raw surface on the opposite side the same distance from the edge of the wound, and coming out on the mucous surface of the bowel where it is tied, the knot resting within the lumen of the gut. Special care should be taken to include the ends of the sphincter muscle in the last two or three sutures. It is well to place a silk-worm-gut suture back of the first row taken to reinforce the latter to prevent too great a strain upon them, to avoid their tearing out, if possible.

The vaginal wound is next closed with silk-wormgut sutures as previously described, care being taken to include sufficient tissue within the suture to prevent it cutting out before the wound unites. Following the operation, the patient should be kept at rest in bed for two weeks or more on a moderately spare diet. It will not be necessary to bind the legs together, but on the other hand she is allowed to turn from one side to the other at will.

The urine should be drawn with a catheter for the first few days, always being careful to protect the wounded surfaces from the urine and other irritating discharges.

The sutures should be removed in ten or twelve days, when the parts will be found quite firmly united, if no complications prevent the union. It will be well for the patient to avoid strenuous work, such as lifting and straining, for a month or more after she is up and around.

PAROVARIAN CYSTS

Parovarian cysts, or cysts of the broad ligament, are generally the result of an infectious inflammation.

The seat of the morbid state is in one or more of the embryonic tubes that compose the structure of the broad ligament. It is contended that when one tube only is inflamed or infected,

a single cyst will be produced; and when two or more tubes are involved, multiple cysts result. As these cystic formations develop within the folds of the broad ligament they displace the adjacent tissues and often attain a growth of considerable size. The fluid that is contained within the cyst walls is thin, watery, and of straw color. Their development is not rapid, nor the symptoms acute, except the morbid condition appears as a complication to inflammatory states of the adjacent organs.

Pain is not a marked symptom, except when the tumor is of large size; then it is principally due to pressure. A digital examination through the vagina may outline the cystic growth, but will not provoke the pain that is usually experienced in pyosalpinx and other abscess formations.

The cyst, when of large size, often extends down upon the side of the uterus, where it may be readily outlined with the finger, as it sweeps around the cervix, giving the impression that the cyst and uterus are but one mass of tissue.

The broad ligament cyst is to be differentiated from pyosalpinx and ruptured ectopic gestation by the prevailing symptoms accompanying these morbid conditions. The cyst imparts to the examining finger a sensation of pent-up thin fluid; there is no history of rigors, hectic fever, thirst, headache and severe pain,

Fig. 386.—Primary incision in laparotomy. (*Howe.*)

that are nearly always present in pyosalpinx and in many cases of ectopic complications.

Treatment: The treatment is essentially by surgical measures. Without complications, the cyst can be approached through an opening in Douglass' cul-de-sac, and its contents evacuated by forcing the point of a closed pair of scissors through the cyst walls, spreading them as they are withdrawn, the fluid escaping into the vagina. If the cervix of the uterus be seized now with volsellum forceps and traction made downward, it will be possible to bring the cyst within reach, when its cavity can be explored with the finger for secondary cysts, and if found, they should be broken down, at the same time being careful not to display too much force, that injury may be done to vascular structures. Following the evacuation of the cystic fluid, iodoform gauze drainage strips should be placed just through the opening in the cul-de-sac; the uterus should then·be allowed to assume its natural position and the vagina lightly packed with

Fig. 387.—Evacuating an abdominal cyst with a canula. The collapsing sac is grasped with forceps and withdrawn through the abdominal incision as fast as the fluid escapes. (Howe.)

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Fig. 387.—Evacuating an abdominal cyst with a canula. The collapsing sac is grasped with forceps and withdrawn through the abdominal incision as fast as the fluid escapes. (Howe.)

gauze. It will not be necessary to pack the cavity of the cyst, except to check possible hemorrhage. When this is done, the packing (which should be iodoform gauze) should be removed at the end of twenty-four hours.

In cases where the cyst is of large size and rises high in the pelvis, the operative procedure should take place through the abdomen, aspirating the most of the fluid away and then walling off the cyst with sterile pads before opening. When very large, the redundant cyst walls should be removed with scissors, afterwards closing all traumatic surfaces in the usual way. The peritoneum in the external wound is then closed with catgut sutures and the remainder of the abdominal structures closed with silkwormgut, and the wound dressed antiseptically and a bandage applied.

CYSTS OF THE OVARIES

Cysts of the ovaries are mainly due to a degeneration of some portion of the stroma of the organs or the Graafian follicles and may develop to a size that will involve the entire organ. The growth may be monocystic or polycystic, the former often attaining to a large size, while the latter usually presents growths from the size of a pea to that of a quart measure or larger.

The walls of the single cyst are generally thick and tough, while that of the others are usually thin and easily broken down. The contents of these growths varies from a thin, clear fluid to a gelatinous mass, viscid or of the color of syrup. Flocculent matter is often present in the contents of the larger cysts.

This variety of tumor is commonly observed in women of middle and advanced age, and especially in such as have suffered from uterine irritation due to menstrual disorders and frequent child-bearing.

The symptoms are mostly those of distress, caused by pressure upon adjacent organs after the tumor has developed to a considerable size. Later along in the development of the growth there is loss of appetite, strength and flesh, the features become pinched and there is an expression of worry about the

face. The patient is in distress when lying down and respiration is markedly interfered with. The desire to urinate is frequent and the function of the kidneys and bowels is often erratic.

Regarding the treatment of cystic growths of the ovary, it may be said that, unless the tumor is surgically removed, death is about sure to terminate the patient's life from rupture, followed by peritonitis, septic purulency resulting from a twist of the pedicle, rupture of the ovarian artery and hemorrhage into the cyst, and, through the lack of nutrition, there is a consequent physical exhaustion.

Before resorting to operative measures for the removal of the cyst it may be well to have in mind several other morbid conditions that may have their origin near the ovaries, the symptoms accompanying which, in many respects, simulate those in cystic development. Chief of such abnormities may be mentioned tumors of the broad ligament, pelvic hematocele, extrauterine pregnancy, solid ovarian tumors, uterine tumors, double uterus, hydrosalpinx and tumors originating in the abdominal wall. It must be remembered also, that the symptoms in many of the morbid conditions mentioned are obscure and nothing short of an exploratory laparotomy will reveal the true character of the local disease.

Treatment: The technic of a laparotomy operation for the removal of an ovarian cyst is here briefly given: After the patient has been prepared in the usual manner and placed under the influence of a general anæsthetic, the abdomen is opened in the median line to the extent of six inches or more. After retracting the margins of the incision, the cyst, if large, will at once appear in the open wound, when its contents should be removed with a trocar and canula and the collapsed sac drawn out through the abdominal incision, its pedicle securely ligated with silk, and severed with scissors. Next inspect the stump, and if there is no hemorrhage from divided vessels, place it within the abdomen and after clearing the ventral cavity of excess fluids, the external wound is closed in the usual way, without provision being made. for drainage.

Large pedicles are usually ligated in halves and to insure

the case against secondary hemorrhage, the divided arteries should be picked up and tied separately with sterile catgut.

Complications must be dealt with as the nature of the individual case will require, and in case the walls of the cyst are extensively adhered to adjacent structures, the evacuation of the cyst contents may be all that can be done to relieve the patient for a brief period.

Through every step in the operative procedure, strict attention should be paid to the antiseptic technique and care taken not to lacerate or otherwise unnecessarily injure the adjacent organs or the parietal peritoneum, during the progress of the work.

At the conclusion of the operation, the external wound should be dusted with boric acid or other potent antiseptic powder, after which sterile gauze pads are placed over the wound and secured in position by the adjustment of a many-tailed bandage.

Pain may be allayed for the first few hours, following the operation if severe, by the hypodermic injection of one-eighth grain of heroin, and to relieve thirst an occasional sip of hot water may be taken or salt enemas given. Gas pains will require high rectal enemas of turpentine, glycerine and warm water, while nausea and vomiting are held in check after the second day with sips of ginger ale. Re-dressings will be required in a week, if all goes well, and with no complications, the patient will sit up at the expiration of three weeks and may be considered well in a month.

PROLAPSE OF THE OVARIES

Because a prolapsed ovary, when of considerable size, simulates abnormalities of other pelvic organs, the morbid state becomes of interest to the general surgeon. The displacement may take place without any deviation of the uterus; then again, it may depend entirely upon a displacement of that organ; a retroverted uterus always drags the ovaries backward with it, the ovaries usually resting in front of that organ, but not infrequently they may be found well behind it and as low down

as the cul-de-sac; when found in this position, the tender ovary is rendered exceedingly painful during a bowel movement.

During the menstrual period, a severe dragging pain is a feature, and sexual intercourse is distressing in most cases. It not infrequently happens that the ovaries and tubes become firmly adhered to the posterior part of the uterus and adjacent tissues through inflammatory action.

Prolapse of the ovaries, as well as other displacements of the sexual organs, is generally due to wrongs of gestation; however, the morbid state may follow traumatism, or it may be the result of the presence of tumors, or prolonged periods of congestion.

Treatment. The treatment of displacement of the ovaries may be by medicinal and surgical methods; the former can be only palliative and consists of the internal administration of remedies to relieve congestion and control pain. In this connection gelsemium, viburnum, belladonna and macrotys may be thought of, each prescribed according to the specific indications for the drug. Some relief may be obtained from the application to the cervical region of the vagina of Churchill's tincture of iodine or a mixture composed of the following agents:

℞.
Iodine crystals ....gr. xx.
Potassium iodide ....gr. xl.
Alcohol .... ℥ j.
M. Sig.—Used topically to mucous surfaces.

In cases where the congestion is great, cotton tampons wet in a mixture of tincture of iodine two parts and glycerine three parts, and placed next to the cervix or in the cul-de-sac, will bring prompt relief within a few hours. Where the above remedies are not at hand, quick relief may follow irrigations of the vaginal canal with hot saline solution. During the time the patient is taking this form of treatment, she should rest in bed, being restricted to a moderately spare diet, at the same time keeping the bowels open with mild laxatives and the kidneys stimulated with diuretic remedies.

Operative methods consist of opening the abdominal wall, replacing the uterus and doing a fixation to that part of the abdominal parietes best suited to retaining the prolapsed ovary

in its normal position, or removing the ovaries if they are found diseased or for valid reasons fixation is impracticable. If retroversion of the uterus is the cause of the ovarian displacement, a ventro-fixation of that organ had better be executed at the same time the ovaries are treated. Removal of the ovaries is not justified by mere displacement, unless there is constant pain accompanying the prolapse that incapacitates the patient, if she be a working woman, from performing ordinary labor.

The work, if done under strict antiseptic precaution, is devoid of much danger and generally proves successful.

HERNIA OF THE OVARIES

A displacement of the ovary to the extent that it may be found wedged in the inguinal canal along the side of the round ligament is not an uncommon accident.

The tube may accompany the ovary in its descent, and both may be found in connection with a loop of intestine, rendering the morbid condition one akin to a complicated hernia. The conditions favoring the abnormal state are usually due to severe strain in attempting to lift heavy obstacles or to congenital malformation of the pelvic organs and tissues. When the hernia is due to the latter cause, both ovaries are usually involved, or in other words, the morbid condition is bilateral.

The ovary in the inguinal canal may become adherent to the round ligament at or near the entrance of the internal abdominal ring, which will prevent its further descent, but will not insure it against structural changes, such as the organ undergoes in cystic degeneration, and the formation of morbid growths.

The most prominent diagnostic symptoms accompanying hernia of the ovary are the presence of a tumefaction in the region of the inguinal canal, which is tender and often provokes nausea upon pressure, pain due to congestion at the menstrual period and a dragging sensation at other times. Any of the above symptoms may be so aggravated at times as to incapacitate the patient from being on her feet or to perform any kind of labor.

As before remarked, a loop of intestine may accompany the hernia of the ovary and even a goodly portion of omentum has been found in the canal with the ovarian protrusion.

This condition should be kept in mind while forming a diagnosis, and especially so when operating to relieve the abnormal state. Other diagnostic symptoms of value are a deflection of the uterus to one side when one ovary is involved in the inguinal canal and the absence of the ovary from its normal position on the side that the hernia is suspected.

Treatment. The treatment embodies two methods, a reduction of the hernia and its retention with a suitably formed truss which must be adapted to the early stages of the protrusion, and this failing, a resort should at once be had to operative measures, similar in nature to that practiced in other inguinal hernia. If after opening the canal the ovary is found diseased, it should be pulled out of the incision far enough to enable the surgeon to tie off and separate the broad ligament. Then remove the ovary, after ligating the pedicle, replacing the latter within the abdomen, after which cleanse the wound and close it in the usual manner.

METRITIS

Inflammation of the body structures of the uterus becomes of interest to the surgeon as soon as the medicinal measures usually prescribed in the treatment of the disease fail to give relief and surgical means are required to remove the diseased organ.

The abnormal condition is produced by many causes, chief of which is abortion, followed by infection, morbid growths, and displacements of a marked degree. When due to the first named cause, the uterus is extremely sensitive, more or less congested, and enlarged to a greater or less degree. There is usually a profuse muco-purulent discharge from the organ, very offensive to the sense of smell, and not infrequently there is more or less pelvic cellulitis accompanying the diseased condition.

When the disease results from the presence of morbid growths, the onset is usually gradual, but becomes progressively

worse unless the nature of the disease is determined early and the organ removed.

If the morbid condition is due to displacement, congestion and hypertrophy accompany the diseased state, which give rise to such symptoms as cystitis, pelvic irritation, constipation, and dragging pain in the uterus; these symptoms depending largely upon the position that the displaced organ assumes.

The general symptoms observed in acute metritis are rigors followed by a rise of temperature to 103 degrees to 104 degrees F., rapid pulse, thirst, restlessness and general malaise. Nausea and vomiting are also common symptoms when the pelvic peritoneum is affected. If there are no complications, the case will likely recover in ten days to two weeks under proper treatment, but should the case terminate in abscess formation there will be repeated rigors, followed by hectic fever terminating in periods of sweating. If the purulent collection breaks through into the cavity of the uterus, a speedy recovery may be looked for, but should it find its way into the pelvic cavity, the case generally results fatally. Not infrequently the abscess breaks into the bladder or rectum, in which case the treatment is rendered extremely complicated.

In the chronic form of the disease the uterus is enlarged, due, in a great measure, to an increase in the connective tissue of inflammatory deposits. This form of the disease is seldom preceded by acute metritis, and is often due to causes other than those provoking the acute attack. Of the common causes of the chronic metritis may be mentioned excessive coitus, cold, and irritant vaginal douches, subinvolution, infectious endometritis and excessive masturbation.

The symptoms commonly observed in chronic metritis are dull aching pain in the hypogastrium, made worse by being on the feet, profuse leucorrhœa, menorrhagia, constant backache, headache, and nervous debility. There is more or less vesical irritability, and the bowels are usually constipated.

Treatment. The medicinal treatment in the acute form of metritis, to be successful, requires the patient to be kept at rest in bed, in a cool room and on a mild but nourishing diet. If the organ is much inflamed, warm vaginal douches of some antiseptic solution several times a day will be of much benefit as

will rectal injections of witch hazel and warm water, or laudanum and starch water, the latter mixture, composed of ten drops of laudanum to the ounce of starch solution, will give prompt relief to vesical irritation and pelvic pain which are nearly always present in metritis.

The mixture used at bed time will insure rest and generally refreshing sleep through the night.

Aconite and gelsemium given internally will control in a measure rigors and hectic fever, restlessness and pain. Dioscorea is also given for the latter symptom when the pain is spasmodic with contraction of the tissue. Soreness of structures will call for macrotys, and painful menstruation for ignatia and viburnum. Belladonna given in alternation with mitchella are remedies to be thought of to relieve marked congestion of the womb and ovaries and the dull pain accompanying that morbid condition.

When the above treatment fails to give relief to the morbid state of the uterus, glycerine tampons may be placed against the cervix once or twice a day and scarification of the cervix in congested conditions is not without benefit.

A collection of purulent fluid will sooner or later point in the direction of the least resistance, and if this point can be observed it should be incised as early as possible and free drainage established, but should the abscess rupture into the pelvic cavity, laparotomy must be executed at once and the purulent fluid drained away and the pelvic cavity flushed with warm saline solution and free drainage established.

Metritis is slow to yield to medicinal treatment and surgical measures do not always give prompt relief.

The treatment of the chronic form should be along the line of first relieving any morbid condition of the system upon which the metritis depends. Anemic conditions of the body will require iron, arsenic, phosphorus and the lime salts given in alternation, together with nutritious and easily digested food. Nitrate of strychnia in small doses will give strength to an exhausted state of the nervous system. Ergotal or ergotine in small but repeated doses is suggested in chronic congested conditions of the uterus; the function of the bowels and kidneys should be stimulated to action and the pores of the skin kept

free by frequent warm saline baths. Locally, glycerine tampons should be inserted per vagina once or twice a day, followed by hot vaginal douches. Depletion of the congested condition of the organ may be accomplished by scarifying the cervix once or twice a week following a hot douche.

In cases where the cervix is elongated and in a state of irritation through the presence of cicatricial tissue, an amputation of the cervix should be done and a hysterectomy performed when the body of the uterus is seriously involved in the necrotic disease.

Leucorrheal discharges are controlled with douches of a one per cent solution of permanganate of potash, the alkaline solution, dilute pinus canadensis and dilute hamamelis, with such remedies taken internally as the individual case may call for.

PART TWENTY-EIGHT

Lesions of the Urinary Organs

INJURIES TO THE KIDNEYS

Rupture of the kidney, resulting from external force directed against the lumbar region, is often of so serious a nature as to call for immediate surgical interference. If the cortical body is lacerated, including the capsule of the kidney, the hemorrhagic flow soon infiltrates the loose cellular tissue surrounding the kidney and may reach and discolor the integument in the lumbar region. If the laceration extends through the entire body of the urinary organ, into the pelvis, blood in small quantities will be voided with the urine.

The symptoms accompanying injuries to the kidney will vary in character according to the degree of traumatism the organ has suffered. Tenderness and pain in the region of the kidney *uret* are usually marked symptoms, with some degree of swelling. Nausea and vomiting are also early symptoms in extensive lacerations; irritation of the ~~uterus~~ extending to the bladder is commonly met with, especially if hemorrhage occurs as a result of the rupture; in these cases, small round coagula appear in the urine in varying quantities. Abscess formations in the loins not infrequently follow extravasation of blood, serum, and urine, into the cellular tissues.

Treatment. Injuries of the kidney of a minor nature usually recover without resorting to surgical measures; the patient should be enjoined to rest in bed and be given frequent small doses of gelsemium and aconite or cannabis indica, with an occasional one-eighth grain of heroin given hypodermically in the region of the injury, to insure rest; but should the patient show a marked degree of shock, pain and hemorrhage, after twenty-four to thirty-six hours, under the above treatment, surgical measures should be urged to the patient and friends.

This course agreed upon, the patient is prepared in the usual way; an incision six inches in length is made in the loin over the kidney, exposing the organ to physical examination. If extravasated blood and serum are encountered, it should be evacuated and clots removed from the kidney if found in the wound. If bleeding points are observed, they should be picked up and ligated when possible, otherwise the wound in the kidney should be packed temporarily with sterile gauze, the kidney liberated from adjacent tissue sufficiently to permit it to be brought well into the incision; the packing is then removed and the surfaces wiped dry with gauze sponges; the margins of the rent are then approximated and held in apposition with interrupted chromicized catgut sutures, introduced with a curved needle fastened in a long handle. A deep bite should be taken in the kidney walls to prevent the sutures cutting out when tied. If the nature of the traumatic injury requires drainage, provision for the insertion of a drainage tube surrounded with gauze should be made when placing the catgut sutures in the urinary organ and silk-wormgut sutures in closing the external wound. It is of the utmost importance that the oozing of blood be checked before the wound in the kidney or the external incision is closed, otherwise a hemorrhage may form, necessitating reopening of the external wound and cleansing the field of injury. Extreme injury to the kidney sometimes results in partial or total degeneration of the organ within a few days, necessitating a partial or total nephrectomy at once. In other cases, the capsule may remain intact while the cortical substance may be partly broken down and reduced to disorganized fluid; in this case the capsule should be opened up and drainage established in an effort to save a part of the kidney. The rule is to drain all infected or suppurating wounds of the kidney, and to close, without drainage, any recent healthy wound of the urinary organ.

ABSCESS OF THE KIDNEY

The structure of the kidney is subject to such high grades of inflammation, resulting from external injuries and from internal disturbance caused by the presence of calculi or other ir-

ritating matter that collects in the urinary organ, that abscess formations not infrequently occur in some portion of the cortical substance.

If the purulent fluid forms near the capsule and later breaks through this dense covering, it may gravitate downward and come to the surface at some point in the groin or it may permeate the tissues in the loins and seek escape there; this should be aided by the topical application of warm poultices and incising the skin and fascia as soon as the presence of pus is determined by inserting the exploring needle.

The purulent fluid may break through into the pelvis of the kidney and find escape through the ureter into the bladder, which can be very easily detected by ocular inspection if a quantity of urine is permitted to stand in a glass tube or tumbler for a few hours, or by treating a portion of the suspected urinary sediment in a test tube with a small amount of a solution of potassium hydroxide (caustic soda). If pus is present in any quantity a gelatinous mass results.

The symptoms commonly present during the formation of a renal abscess are rigors and hectic fever, dull lumbar pain, nausea and vomiting, and in some cases uremic conditions supervene.

Treatment. To evacuate a renal abscess through a lumbar incision, the patient is prepared for the operation and placed under the influence of an anæsthetic and turned upon the side opposite to the one to be operated on. To render the site prominent one or two sand bags or pillows are placed under the loin. An oblique incision four or five inches in length is then made over the region of the kidney, extending down through the skin, fascia, cellular tissue, external and internal oblique and transversalis muscles, and lumbar fascia; the fatty tissue surrounding the kidney is then brought into view, which is separated by blunt dissection, exposing the kidney, into which a small exploring needle is inserted, for diagnostic purposes, at any suspicious point where it is likely pus or some foreign substance may be lodged, such as a urinary calculus. If such a morbid state is found to exist, the kidney should be anchored to the margins of the external wound by four or more catgut sutures and the af-

fected area opened by incision and cleared of purulent or other matter, and the cavity flushed with quite warm Thiersch's solution or other antiseptic washes that may be at hand; before closing the wound in the kidney, the cavity should be examined carefully with the finger for communicating abscess formations.

Provision is made for drainage by inserting a piece of rubber tubing through the tissues overlying the kidney and resting against it before closing the external wound. The operation field is kept clean by flushing through the drainage tube which is withdrawn a little at a time as the healing process advances. Should the exploratory incision expose a cyst of the kidney, instead of an abscess, its wall should be incised, or its contents evacuated through a trocar and canula; drainage is established as in the case of an abscess and the cyst walls stitched to the deeper part of the abdominal wound and drained as in the previous case. The external wound is closed with silk-wormgut sutures and dressed with several layers of sterile gauze.

If in opening up the kidney for the relief of abscess formations its structure indicates marked tissue degeneration, it will be well to determine whether or not the ureter is permeable; if it is found obstructed without a possibility of permanent relief, the kidney had better be removed at once, otherwise the purulent fluid will find its way through the tissues in the region of the loins resulting in a permanent fistula.

During the period of recovery the patient's general physical condition should receive attention; to prevent a general pyæmic state of the system, spc. tr. echinacea associated with aconite or gelsemium may be given with marked benefit, alternated with peptics, tonics and stimulants in such quantities as each individual case will require. Rest in the recumbent position should be demanded. The bowels must be kept open and the skin in good condition by frequent sponging with alcohol and water. The food should be light and nutritious and taken at regular intervals.

URINARY CALCULI

The formation of urinary calculi may be found in any portion of the urinary tract, and is of common occurrence among

people of uric acid diathesis and others, who, for a long time, drink freely of waters containing large quantities of lime salts.

As a result of urinary derangements, primary or secondary to a disordered state of the digestive organs, there is a deposit of extraneous matter from which, sooner or later, a nucleus is formed around which layer after layer of uric acid or lime salts is collected until a "stone" of large size presents.

After the calculus has developed to the size of a small marble or larger, its presence excites irritation of the urinary mucous membrane, causing pain and reflex irritation throughout the entire urinary tract. The urine soon becomes ammoniacal and clouded with particles of mucus, giving off strong odors during its voidance. The formation of urinary gravel in early life is generally of the uric acid variety, and it is the most common form met with in advanced life when a history of gout and rheumatism is often obtained from the patient.

Calculi of large size form in the pelvis of the kidney and in the urinary bladder, giving rise to a heavy, dull pain in these organs, besides causing marked functional derangements in nearly all cases with occasional hemorrhage.

It has been observed by surgeons of large clinical experience that males are more subject to the formation of urinary calculi than are females. The cause is difficult to explain, as the anatomical structures are about the same and the habits of life are essentially alike, differing only in certain dietary rules and regulations.

The presence of a calculus the size of a pea in the bladder will often give rise to functional wrongs that could not result from a larger one; chief of these is the blocking of the internal end of the urethra, preventing the voiding of urine for the time.

Small calculi are often found in large numbers, both in the pelvis of the kidney and urinary bladder, while large ones are usually found single. Cases are on record where vesical calculi have been removed weighing over a pound. The larger stones are generally of uric acid formation and present a rough, granular outer surface, while the smaller ones, formed mostly of oxilates and phosphates, are either smooth or earthy and very friable.

Not infrequently a small calculus will start down one of the ureters from the pelvis of the kidney and become impacted at some point between that organ and the bladder, causing partial or complete obstruction of the urinary duct and an overflow into the pelvis of the kidney of urine, giving rise to a morbid condition called **hydronephrosis**. In marked cases of this affection, a decided fullness soon appears in the region of the affected kidney, which upon palpation proves to be soft and fluctuating, without other symptoms than perhaps some tenderness.

In cases where only one kidney and ureter are affected from this cause, the morbid state may last over a considerable period of time before the patient suffers serious systemic disturbance, but when both ureters become obstructed with a consequent damming back of the urine, the patient soon suffers from uremia, terminating in death, unless promptly relieved through surgical measures.

Pain and localized tenderness are the chief symptoms experienced in obstruction of the ureters from an impacted calculus. The pain is colicky in nature and spasmodic.

Calculi sometimes form in the urethra immediately behind a stricture, partially or completely obstructing the urinary duct; the obstructing medium, however, more frequently leaves the bladder during urination, and slowly passing along the membranous canal, finds lodgment at some constricted portion, where, if it is not soon removed, it collects layer after layer of extraneous matter until it may completely block the urinary outlet.

Quite young children are liable to urethral obstruction from the impaction of a calculus; the gravel forming the nucleus slipping into the duct from the bladder, finding lodgment in the membranous portion or near the meatus where it is carried during urination.

The symptoms accompanying urethral impaction will depend largely upon the location and degree of the obstruction, also the character of the stone. If it is rough or angular it will abrade the mucous membrane as it is forced along the urethral track, causing some little oozing of blood at intervals. There will be tenesmus in efforts at urination with sharp pain, gen-

erally experienced in or near the head of the penis. If there is complete obstruction, occasioned by spasm of structures about the calculus, or if the stone completely occludes the urethra, retention of necessity immediately follows..

Calculi with sharp angles sometimes cut through the mucous membranes and, becoming imbedded in the adjacent tissues, either excite inflammatory action ending in suppuration, or are added to by the urinary deposits until they attain a considerable size, requiring removal through external incision.

One of the chief diagnostic symptoms of urethral impaction, especially in children, is their desire to obtain relief by pulling the end of the penis during and after attempts to urinate. The appearance of a drop or more of blood at this time quite firmly establishes the diagnosis.

The calculus can often be felt by pressing over its location when it becomes impacted well along the urethra. Its location may also be ascertained by passing a suitable-sized catheter or sound in the urethra.

Treatment. The administration of medicinal agents has availed but little benefit in the treatment of urinary calculi, although remedies reputed to possess resolvent qualities have been given with a view of dissolving the stone and are still in repute with many medical men.

If from the history of the case and the existing symptoms, it can be determined that the existing calculous deposits are of an acid nature, alkaline remedies are thought to be indicated; while if the deposits show upon examination to be alkaline, medicinal agents of an acid nature are administered. If the surgeon is to be governed in his administration of remedies along these lines, he must also take into consideration what the analysis of the urine reveals. If the urine be highly acid, resolvent powers would hardly be expected from acid drugs, especially should the deposits prove to be neutral or alkaline, the same method of reasoning holding good when the urine proved alkaline and the stone composed of uric acid deposits.

The acid remedies suggested in the treatment of urinary calculi, when indicated by the chemical examination of the urine and the deposits, are dilute acetic and phosphoric, and the acids

of fruit and vegetables. The acid state of the urine or of the calculi will call for the salines and the citrate and acetate of potash in graduated doses well diluted. Carbonate of lithia is an available remedy in this affection, also alkalithia.

Sodium phosphate and benzoate in potent doses well diluted are advised in the treatment of renal uric acid calculi continued over a long period of time. Of the vegetable diuretics possessing some resolvent properties and at the same time relieving irritation of the urinary mucous membrane, spec. tr. hydrangea occupies first place. Combined with saw palmetto and chimaphila, it proves of benefit in cases of scanty urine, cutting pain, marked tenesmus and muco-purulent discharges.

During the passage of small renal stone the acute pain, tenesmus, tenderness, and the accompanying nervous conditions require the patient to keep in bed, and the application of hot fomentations to the loins and perhaps a hypodermic injection of heroin or morphine and atropia. Chloroform inhaled during severe spasms of pain is commended. Impaction of stone within the pelvis of the kidney or uterers will demand prompt surgical measures for relief.

The patient is prepared for operative work in the usual manner and a nephrolithotomy done by exposing the kidney through the lumbar or lateral incision, as described in doing a nephrectomy. After exposing the kidney, if the calculi can be felt, an incision is made down through the overlying tissues and the stone turned out with the finger. In cases where it is suspected but cannot be felt by palpation, it is possible to locate it by the aid of an exploring needle or small probe. With the kidney opened the ureter should be carefully explored for impacted stone by passing a small catheter into the renal duct; if not obstructed, the slender instrument may be made to enter the bladder.

In cases of impaction the stone is likely to be found about three inches below the pelvis of the kidney or near the entrance of the ureter into the bladder, two narrow points in the duct.

If impaction is fully determined, or if the ureter is occluded from other causes, such as stricture or torsion, the duct is exposed for the performance of operative measures through the medium

or lateral abdominal incision, or the lumbo-extraperitoneal route, while the patient is lying on the well side. The latter course gives ample room for exploration and removal of the stone, if one exists, or to rectify other abnormal conditions.

The tissues are divided from a point near the last rib to a point about an inch above Poupart's ligament, the incision passing downward, forward, and curving with the outline of the superior edge of the ilium. The kidney is exposed and the dis-

Fig. 388.—Sinus following the opening of an abscess of the kidney resulting from an impacted calculus.

section carried inward to the peritoneum, care being taken not to open this membrane while making efforts to find the ureter, which lies behind the peritoneum in its upper course near where it is adherent to the spine. The peritoneum is dissected from its holdings with the finger, the urinary duct being found imbedded within its folds.

If the kidney has been previously opened, the ureter may be more readily found by passing a small catheter through it as far as possible. If the examination reveals the presence of

an imbedded calculus, it is removed through a small longitudinal incision made between catgut sutures previously inserted on either side. The ureter should be further explored through the opening for other calculi, which, if found should be removed in a similar manner.

The incision in the duct is then securely closed by tying the previously inserted sutures, the wounded area is cleared of blood and other fluids, the wound in the kidney is then closed with catgut, with drainage provided of gauze or rubber tubing,

Fig. 389.—Calculus partially imbedded in the wall of the bladder, too high to be reached with the sound.

which should extend through the external wound of the body, which should now be closed with silk-wormgut. In most cases, the drainage tube can be removed the second or not later than the third day; with no complications the external wound ought to be healed in two weeks.

After the presence of a vesical calculus has been determined by exploring the bladder with a steel sound, the only reliable method of diagnosis, lithotomy should be resorted to at the earliest convenience for its removal. The successive steps in

the operative procedure when done by the median route are as
follows: with the patient prepared for the operation by thorough
bathing and the bowels well cleaned out, he is placed upon his
back with the legs and thighs well flexed, in which position they
are held by an assistant. A suitable-sized lithotomy staff is next
introduced and made to touch and rest against the stone if pos-
sible. This rule need not be observed if the stone has been pre-
viously sounded. With the staff drawn up well under the sym-
physis it is held by an assistant.
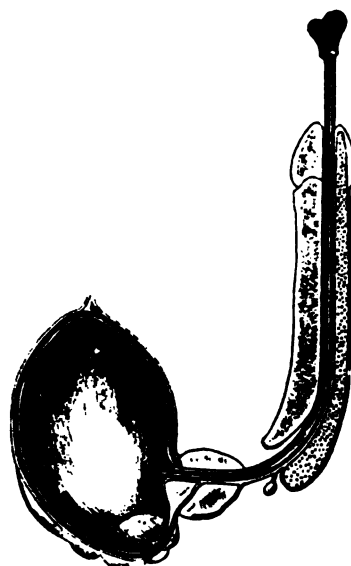
Fig. 390.—Calculus so low in the base of the bladder that
it is difficult to reach it with the sound. (*Howe.*)

The operator, after satisfying himself that the staff is properly
placed, which is done by examination with the finger through
the rectum, makes an incision about one and a half inches long.
extending from a point one half inch in front of the anus up
along the raphe. The point of the knife is guided into the groove
of the staff and made to divide the membranous portion of the
urethra and may be passed on through the prostatic portion into
the bladder, which course will be required if the calculus to be
removed is of large size, or a large-sized grooved director may
be passed along the lithotomy staff into the bladder following

. the division of the membranous portion of the urethra, and the two instruments forcibly separated to dilate the neck of the bladder sufficiently to admit the end of the finger, which is then gradually forced through into the bladder after the lithotomy staff is withdrawn. Moderate-sized stone may be removed through this dilated portion of the urethra with broad-beaked

Fig. 391.—Dotted lines indicate the course of incision through the perineum upon a grooved staff, in operating for stone. (*Howe.*)

lithotomy forceps, being cautious not to lacerate the tissues by using undue force while extracting it.

The margins of the perineal wound should be closed with one or two silk-wormgut sutures to prevent gaping and aid in the healing process.

A little urine will escape through the traumatism for a few days as well as through the urethra, but at length the wound will heal, when normal urination will become established, leav-

ing the patient none the worse for having undergone the oper-
ation.

The removal of the vesical calculi through a lateral incision
in the perineum has nothing to commend it over the median
route, hence the technic of that operation will be omitted here.

Many surgeons prefer doing a suprapubic cystotomy for
the removal of a vesical calculus, especially in cases where the
stone is found to be of large size, or where it has become imbed-
ded in some portion of the wall of the viscus.

Fig. 392.—Incision carried through into the bladder and
the calculus grasped with broad beaked forceps. (*Howe.*)

After the patient is prepared for an aseptic operation and
placed under anæsthesia, the bladder is well irrigated with ster-
ile boric acid solution, the viscus is then partly filled with the
same antiseptic solution and retained, the catheter being re-
moved. If at hand, a small soft rubber bag should be inserted
within the rectum and either inflated with air or distended with
eight to ten ounces of warm water; this course elevates the
bladder and presses it forward within easy reach through a
median incision made in the abdominal wall, extending upward
about three and a half inches from a point just below the upper
border of the pubic bone. The incision divides the skin and

fascia between the recti muscles, the underlying soft tissue is separated with the handle of the scalpel or grooved director until the anterior wall of the bladder is reached. With a little care the peritoneum need not be injured as it does not normally extend lower than the urachus which is attached to the fundus of the bladder.

After exposing the bladder, its anterior wall is picked up with mouse-toothed dressing forceps, or a tenaculum, and brought well into the abdominal wound, where it is opened up

Fig. 393.—Lateral incision in operation for urinary calculi, the dotted line indicating the location of the internal pudic artery. (*Howe.*)

with a longitudinal incision an inch or more in length. The margins of the wound are seized with small snap forceps and brought forward into the abdominal wound and held securely, while the interior of the bladder is explored with the finger or instrumentally. Small calculi, if discovered, are removed with forceps; large ones may require crushing with a lithotrite before making an attempt to remove them.

Before closing the incision in the bladder, its interior should be carefully examined for imbedded stone, and small calculi impacted in or near the bladder end of the ureters or the

urethra. The former may be removed by carefully dissecting back the adjacent tissue, while gentle traction is made on the stone with tenaculum forceps, while the latter case may require a dilation of the diverticulum to the degree that the stone may be removed with the forceps, or scooped out with a small scoop fashioned for the purpose. It often becomes necessary to chip away portions of the lith with sharp-beaked cutting forceps, when it is possible to reach it, before attempting to remove it by irrigation and slender forceps.

The bladder is now washed out with a two per cent solution of boric acid and closed with fine chromicized catgut, the sutures being placed about one-quarter of an inch apart, using a fine curved needle to place the sutures, which should be inserted near the edge of the incision and emerging on the cut surface, evading the mucous membrane of the viscus. After this row of sutures have been placed, a number of provisional sutures are taken with the same material, using the Lembert stitch, and extending this row at least one-half inch beyond each angle of the incision. These sutures are carefully tied, after which the bladder is distended with some bland antiseptic solution to test the possibility of leakage; if any is found the deficient point is secured by other sutures.

The traumatic area in the bladder is now wiped dry with pledgets of sterile gauze, and, if the condition of the wound justifies it, the abdominal wound is closed with silk-wormgut without provision being made for drainage; otherwise a gauze or rubber drainage tube is placed in the lower angle of the wound, the two nearest sutures being left untied until it is removed a few days later.

Following this operative procedure the bladder is kept free of urine through a retained catheter, a perineal drainage tube, or the patient may be allowed to void the urine in the natural way in favorable cases.

Cases of extensive ulceration of the bladder or chronic purulent cystitis complicating vesical calculi may require the bladder wound left closed for a considerable period of time, that the abnormal state of the organ may be treated by the topical application of remedial solutions and gauze packing. In such

38

cases the edges of the incision in the wall of the bladder are approximated and sutured to the margins of the abdominal incision, which is partially closed with silk-wormgut leaving only room enough to insert and remove the necessary medicaments. Through this opening a perforated rubber drainage tube is placed and connected with a longer piece of rubber tubing with a glass tube, through which the urine is siphoned into some suitable vessel partly filled with some antiseptic solution and placed beneath the cot or bed.
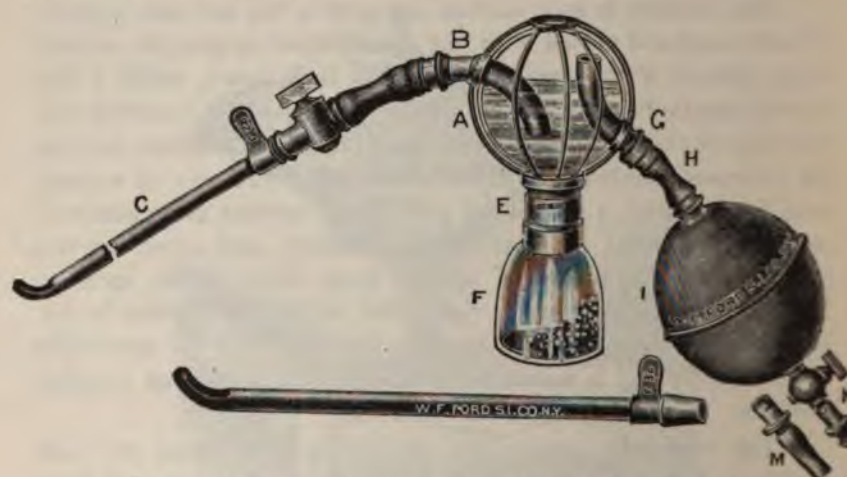
Fig. 395.—Evacuating-tube and washing-bottle utilized in removing small calculi from the urinary viscus. The letters accompanying the illustration have reference to the component parts of the instrument.

The drainage tube that enters the bladder may be prevented from slipping out by applying half-inch strips of adhesive plaster around it, the ends, which should be four or five inches in length, should be extended laterally and made to adhere to the adjacent skin surface.

To prevent infection, pledgets of iodoform or other antiseptic gauze, should be packed around the tube, which should be removed when soiled with seeping urine and repacked. As soon as the morbid state of the bladder has been cleared up, the local treatment is omitted and the margins of the wound freshened and closed with silk-wormgut sutures, as before described.

Fig. 394.— Lithotrite.
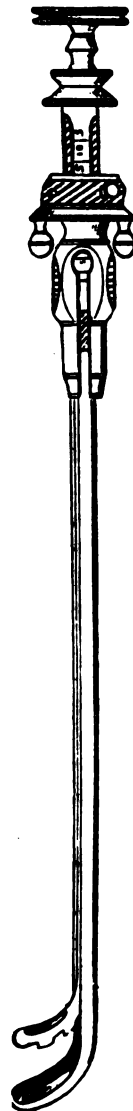
In cases where it is determined that the stone is small or of moderate size, and for any reason cystotomy is refused, an attempt should be made to crush the calculus (litholapaxy) and then remove the fragments with evacuating tubes attached to a wash bottle. (See Cut.)

To properly execute this work, a modern steel lithotrite should be used, graduated to fit the size of the urethra. The mechanism of the instrument should be thoroughly understood before introducing it, and every care taken while engaging and crushing the stone not to injure the bladder. Before attempting to introduce the lithotrite, the patient should be anæsthetized and placed upon his back, with the hips resting upon a pad or cushion.

At the outset the urine should be drawn off, the bladder flushed with a boric solution, after which a few ounces should be left in the viscus to aid in locating and crushing the calculus.

The lithotrite, after it is sterilized, should be lubricated with olive oil or vaseline and carefully introduced, pulling the penis well upon the staff of the instrument to straighten the urethra. The operator should be cautious about depressing the instrument before the beak is brought down well under the pubic bone, otherwise he will inflict severe pain by bruising the wall of the urethra.

The entrance of the instrument into the bladder will be readily determined by a sudden impetus forward, imparted to it as it slips through the neck of the bladder. Through the manipulation of the instrument the stone is located; the male blade is then withdrawn a sufficient distance to enable the jaws to grasp it. This feat may not be accomplished easily, several attempts being required in some cases before a firm hold is secured.

When firmly caught, the blades are made to crush the calculus by forcibly turning the thumb-screw at the outer end of the instrument. As the jaws of the lithotrite are freed, they are

again opened and made to engage large fragments of the stone and crush them, the process being repeated until the fragments have been reduced in size sufficiently to permit them to be removed with the evacuating tube and wash-bottle. It will be well in most cases to introduce the evacuating tube and remove the very small pieces before the larger fragments are all crushed, as by so doing the lithotrite is made to engage these pieces with ease.

To remove the crushed fragments the evacuating tube is passed into the bladder after lubricating it with sterile vaseline. As soon as the urine begins to flow, it is attached to the coupling of the wash-bottle which has been previously filled with quite warm boric solution. The stopcock in the tube is opened and the water in the bottle forced into the bladder by compressing the rubber bulb, and by quickly relaxing the force the bulb expands, bringing out the fragments by suction. This process is repeated time and again by compression and relaxation of the rubber bulb until the viscus has been freed of the crushed fragments.

The amount of water necessary to flush the bladder will be determined by the individual case. If the bladder has been made irritable and extremely sensitive by the presence of large calculi with a rough granular exterior, the organ will not bear more than three or four ounces of water at first to flush out the crushed fragments.

To insure that the fragments have all been removed, the operator should use a steel sound as a searcher for remaining fragments, or depend upon the clicking noise given off by the remaining fragments striking the end of the evacuating tube when suction is made, which is quite distinctly heard when the ear is placed over the bladder during the flushing process.

Following the operation, the patient should be kept at rest in bed. A nonstimulating diet should be advised. The patient may be allowed plenty of water to drink. Severe irritation and pain may require irrigation with tepid boric solution once or twice a day. The bowels should be kept open with broken doses of sulphate of magnesia aided by tepid enemas.

TUMORS OF THE KIDNEYS

The kidneys are often the seat of tumors that vary in size and consistency. These growths may be benign or malignant, cystic or solid in their formation. The cystic variety is either serous or hydatid and may be congenital or acquired. Their development is usually slow and attended with little pain. The most prominent symptom is the gradual bulging of the region over the kidney by the extension of the growth. Fluctuation may be noted on palpation in cysts of large size.

Of the malignant variety of growths attacking the kidney, carcinomata are the most frequently met with. Stone in the pelvis of the kidney and chronic nephritis are generally the exciting causes of the morbid growths.

The growth when primary in the kidney usually appears after the middle period of life and develops very rapidly. There is tenderness over the region of the kidney, pain of a cutting character, especially on pressure. There is frequently hematuria which is a marked diagnostic symptom of malignancy or stone, more likely the former if the patient shows a cachectic state of body and there is gradual loss of weight. As soon as the growth commences to disintegrate, shreds of malignant tissue will be voided with bloody urine. Hemorrhage is not an unfrequent complication in growths of the kidney, likewise hydronephrosis, which is the result of a partial obstruction of the ureter.

Treatment. The treatment of tumefactions of the kidneys is entirely surgical. Cysts may be cured by repeated aspiration, although incision with drainage is much more satisfactory in most cases. The operative work is done under careful antiseptic measures and usually results in a cure.

Before attempting the removal of a kidney, in case of a malignant growth, the condition of the opposite kidney should be ascertained, and if found in any respect abnormal, operative measures should be postponed until the nature and extent of the wrong can be fully determined. This can only be done by palpation, exploration through an incision, and urinalysis.

The removal of a kidney is done under chloroform anæsthesia, the patient first being prepared for the work in the usual

way. The successive steps in the operation are given under the head of nephrectomy, to which the reader is referred.

PROLAPSED (FLOATING) KIDNEY

When the renal vessels and the ligamentous tissues surrounding the kidney become relaxed, permitting the glandular organ to assume an abnormal position behind the peritoneum,

Fig. 396.—Palpating the abdomen for prolapsed kidney, the patient assuming the erect position.

the organ is in a state of prolapse. The morbid state may be congenital, or it may be the result of traumatism, pregnancy, tight lacing, fecal impaction, and increase in weight through the effect of disease. The morbid condition is more frequently met with in women than men, and is incident to early adult life.

The common symptoms accompanying "floating" kidney are a sense of weight in the loin or lumbar region, and dragging pain when standing or walking about; tenderness of the organ, more or less marked, on pressure, and in some cases pronounced nervous conditions arise somewhat bordering upon hysteria. Pro-

lapse of the kidney may and often does exist without provoking
any symptoms of note and is only discovered by the surgeon
while examining the abdomen for some physical wrong. To de-
termine that the kidney is prolapsed, the patient should be
placed in various positions while the surgeon, with one hand plac-
ed on the lumbar region pressing forward, with the other he makes
deep kneading palpation over the region that the wandering
organ usually occupies. In aggravated cases, where the kidney

Fig. 397.—If, after replacing the kidney, the side is grasped
with the thumb of the surgeon pressed deeply beneath the
ribs, and the patient then takes a deep breath slowly, the
descent of the kidney will be detected as it passes between
the thumb and fingers.

gravitates far from its normal position, all the symptoms at-
tending the serious state are increased in severity and simulate
to some extent the symptoms observed in a congested state of
the kidney resulting from a twisted state of the blood vessels, or
of the ureter with the consequent retention of urine in the pelvis
of the kidney. It is very necessary that the true morbid con-
dition be determined, if possible, before any method of treat-
ment, whether mechanical or operative, be determined upon.
Not infrequently, tumors of the abdomen have been mistaken for
a prolapsed kidney.

A kidney is said to be dislocated when, through inflammatory adhesions, it becomes fixed in an abnormal situation.

Treatment. The treatment of prolapse of the kidney is by hygienic, mechanical and surgical measures.

Mechanical appliances, such as belts, pads, corsets, and compresses, so adjusted as to offer support to the replaced organ, may give some relief from the dragging pain frequently experienced in this affection, but from the very nature of the morbid condition the relief can be only temporary, and the wearing of the appliances is likely to provoke more or less irritation to internal structures in course of time. The affection is decidedly a surgical one, and in all pronounced cases, where the diagnosis clearly determines a prolapse of the organ, nephrorrhaphy gives the only promise of a cure. That it is impossible for the kidney to do its work normally when in an abnormal position makes it all important to adopt measures that will insure keeping the organ in its normal situation, and this can only be accomplished by fixation through operative measures.

Briefly the successive steps in the operative procedure are as follows: the field of operation carefully sterilized and the patient anæsthetized, the kidney is exposed through an incision three or four inches long, starting at a point about three inches from the middle of the back, parallel to the last rib and about one inch below it, and carried down through the skin, fascia, and the subjacent muscles, exposing the fatty capsule of the kidney, which is now divided and stripped back a sufficient distance to permit the passing of three or four stout catgut sutures with a curved needle from the anterior to the posterior surface, care being taken to get well within the border of the kidney; the sutures should be placed about one-half inch apart, passing through the border of the lumbar fascia in the inner lip of the wound, so that when tied the exposed surface of the gland is held snugly up against the incised site of the abdominal wall. The external wound is now closed, with or without drainage, silk-wormgut being used in preference to other suture material. If an excessive amount of fat is encountered throughout the wounded structures, a gauze drainage had better be placed in the lower end of the incision before adjusting the sutures. The external dress-

ings consist of gauze, sterilized cotton and a four-inch bandage to hold the dressing in place. The patient is kept in bed from three to four weeks and enjoined from taking strenuous exercise for six months following the operative work. The prognosis is usually favorable.

That success may follow the operative work for the cure of prolapsed kidney, the surgeon should have a care that he does not anchor it too low down, that the organ be subsequently compressed or irritated by wearing tight clothing or corsets; he should also observe that the colon be entirely freed from the gland before it is sutured to the abdominal wall in cases where the bowel is adhered to the kidney; and subsequent to the operation, all digestive disturbances that might be responsible for the prolapse of the kidney must be corrected.

MALIGNANT DISEASE OF THE KIDNEY

Malignant disease of the kidney is of frequent occurrence, individuals of all ages being subject to the degenerative affection.

Of the two varieties of growths that attack the urinary organs, carcinoma is the most rapidly fatal; it is more often observed in adults than in children, and appears in two varieties, epithelioma and medullary; the former is usually secondary to some other affection of the kidney and is generally located in the pelvis of the organ, while the latter variety generally involves the entire stroma of the kidney.

Sarcoma of the kidney is quite common in early life, but may attack persons of middle age as well. The development of these growths is quite rapid in individuals of a scrofulous habit of body and often attains to a great size. The writer had charge of a case of this nature in a little girl three years of age, in which the tumor attained the size of a child's head and weighed six and a half pounds at her death. The small round-cell variety develops more rapidly than do the other forms of the growth. The medullary growth often runs a course of from two to four years, depending largely upon the malignancy of the case.

The symptoms commonly observed in malignant disease of the kidney are pain and distress in the region of the organ, often hæmaturia, and the swelling always present in these cases; besides the symptoms enumerated there is, in advanced cases, a cachectic state of the body with marked emaciation. The appearance of blood in the urine may be an early symptom but is not a constant one. Pain commences as soon as the growth develops sufficiently to produce pressure, and increases in intensity as the organ enlarges.

Treatment. The treatment consists in the removal of the diseased kidney as soon as the nature of the symptoms points out the character of the affection. Before doing a nephrectomy, careful measures should be adopted to ascertain, if possible, if the opposite organ is in a healthy state; if found not to be, the condition of the individual case should decide whether or not operative measures should be resorted to. To remove the kidney the reader is referred to the article on nephrectomy.

TUBERCULOSIS OF THE KIDNEY

This morbid disease of the kidney is occasionally met with in general practice, not always as a primary affection, but often secondary to the attacks of the urinary organs lower down.

The disease appears in two distinct varieties, each having some characteristic features unlike the other. The acute miliary form is frequently met with in early life, and often runs a rapidly fatal course, especially if other important organs are involved. Both kidneys are generally affected, the stroma of the organs being studded with minute tubercles the size of mustard seed, the presence of which excites more or less inflammatory action. The other form is chronic in character, small areas in the stroma of the kidney containing a quantity of caseous matter which becomes liquefied sooner or later under the influence of mixed infection, the several areas containing pus later coalescing, forming abscesses which often break through into the pelvis of the organ. This form of the disease is observed more frequently in adults than in early life and is mostly confined to one kid-

ney. The onset is generally slow and its progress varying according to virulence of the attack.

In cases where the disease is primary in the kidney, the morbid condition usually extends downward along the ureter to the bladder, through the continuity of structure, even reaching the prostate and epididymis eventuating in inflammation of each of the organs named. When the disease extends from below upward, the pelvis of the kidney is the part first affected, the pyramids next, then the tubules and surrounding tissues, and lastly the cortical substance, which, owing to its tough character, confines the disease to the kidney a considerable period of time; at length, however, the disease may extend to the adjacent organs, the liver, spleen, and even the mesentery of the bowels. The disease does not always pursue such a fatal course as in many cases the progress of the affection is stayed by the great resisting power of the individual.

At the outset, the symptoms of the disease are negative when it commences in the kidney, and remain so until cavities or abscesses form to obstruct the ureter and tubules of the organ. It is at this period that the patient suffers rigors, fever, pain and soreness upon pressure, periods of sweating, and physical exhaustion, and in severe cases pus and blood occasionally appear in the urine, which the patient is obliged to void frequently, owing to a certain degree of cystitis that is nearly always present in these cases.

The kidney can usually be palpated through the overlying muscular structures when it attains any considerable size, especially if the individual be of spare habit, but pressure always notes a tenderness of the organ and increases the pain while the organ is in an irritable state. As before stated the development of the disease in the kidney is slow, except in cases where the ureter becomes obstructed by the accumulation of the morbid matter, the tumor mass then increases rapidly in size and is very painful.

In cases where the cheesy deposit is secondarily infected and suppuration follows, the patient generally experiences rigors and hectic fever followed by colliquative sweating, loss of appetite,

and at length the general health becomes impaired and the patient lapses into a state of exhaustion.

Before resorting to surgical measures, the only possible hope for relief in tuberculosis of the kidney, it should be determined which of the organs is affected. This can only be accomplished in advanced cases by catheterization of the ureters, when this is feasible, and a careful examination made of the urine thus obtained. Then again the morbid state should be differentiated from the presence of a calculus in the pelvis of the kidney, malignant disease, and other diseased conditions, the symptoms of which, in some particulars, simulate those noted in tuberculosis of the organ.

Many surgeons rely upon the tuberculin test in establishing the diagnosis of a tuberculous kidney, in the absence of any sign of the disease in other portions of the system. In the early stages of the disease, the examination of the urine gives negative results so far as establishing the presence of tuberculous matter in the kidney is concerned. At a later period, after the disease has involved the pelvis of the kidney, blood, pus, and tubercle will likely be found in the urine. The indigo-carmine test will also go far toward establishing the normal condition of the urine.

Treatment. The treatment of tuberculosis of the kidney consists in its removal as soon as the nature of the disease has been established, regardless of whether or not other parts of the genito-urinary organs are suffering from the morbid condition, especially in those cases where the disease originated in the kidney; the exception being those cases where both kidneys are seriously involved. To remove the kidney when adjacent organs are in an advanced stage of the disease should be done with the expectation of giving only temporary relief. The general system in the meantime should be toned up with potent tonic remedies, with the patient living a life out of doors in so far as possible. The best of nourishing food should be partaken of at regular intervals and frequent bathing in salt water encouraged.

The technic of the operation for the removal of the kidney is given in detail under the head of nephrectomy, to which the reader is referred.

ADENITIS—BUBO

Inflammation of certain glands is known as adenitis. These growths are classified as benign, and in structure resemble the tissue of the organ in which they originate. The morbid condition is well represented in inflammation of the lymphatic glands of the neck and inguinal regions. In the latter case the morbid state is spoken of as bubo. The inflammatory state of glands may be acute, subacute, or chronic; the two former stages are nearly always secondary to inflammation of adjacent parts from which the afferent lymphatics proceed. The lymphatic vessels do not always take on a suppurative state even when the glands break down from abscess formation. Germs of infection that have produced the surrounding inflammatory state are often found in the suppurating gland. Marked examples of adenitis are observed in many forms of local and constitutional affections, such as erysipelas, gonorrhea, traumatism, cancer, syphilis, tuberculosis, malarial infection, and glanders.

The symptoms usually observed in lymphadenitis are heat, pain, redness, local swelling and sometimes œdema; the latter is a familiar symptom when the gland breaks down in suppuration. Inflammation of the gland manifests itself in a few days in the acute infection of gonorrhœa and erysipelas, in about three weeks following the appearance of a chancroid, and at various later dates in tubercular affections.

Treatment. The treatment in the early phases of adenitis consists in making use of such medicinal means as will subdue inflammatory action and prevent, if possible, a breaking down of the gland in suppuration. To accomplish the first object topical application of cooling lotions to the affected area will accomplish much good. The familiar lead and opium wash is often used for this purpose. The following lotion is effectual in most cases of the acute form of the morbid state following traumatism, and erysipelas:

R.
```
Spec. Tr. Echinacea  ............................... ℥ ss
Tr. Arnica  ........................................ ℥ j
Witch Hazel  ....................................... ℥ ij
Aqua Dest., q. s.  ...............................fl. O j
```

M. Sig.—Use topically to the inflamed area every hour or
two, as may be needed.

In cases where inflammatory action has run high,
and suppuration is threatened, painting the part with
iodine once or twice a day will be of consequence. Evacuating
the pus where the gland has broken down in suppuration and
clearing the cavity with alkaline solution and dressing with sterile
gauze will be all that is demanded in such cases. If after the
glandular abscess has been incised, the healing process is slow
to start it may be stimulated to action by brushing the sup-
purating surfaces lightly with phenic acid once every other day.

Internally, aconite, phytolacca, and echinacea will be indi-
cated in adenitis resulting from gonorrhœa, erysipelas and trau-
matism, while cases resulting from constitutional diseases as
cancer, syphilis, tuberculosis and glanders, will demand in con-
nection with the above medicinal agents, the iodides, arsenic, and
such stimulating and tonic agents as will be indicated in weakly
and depressed constitutions.

Where the enlarged glands lie near the surface they can be
dissected out when suppuration is threatened. In chronic cases
careful attention should be given to the diet, which should be
light and nutritious, and taken at regular intervals. Sulphur
baths should be taken once or twice a week, and the bowels
regulated with saline aperients.

ANASTOMOSIS OF A DIVIDED URETER

Anastomosis of the divided ends of the ureter is required
when that duct is accidentally severed. The union has been
accomplished by an end to end anastomosis, but the operation
is somewhat difficult to perform and then it is not always suc-
cessful, as the lumen of the urinary tube is likely to be en-
croached upon, producing a stricture at the point of union. If
this method of union is undertaken, fine silk should be used for
sutures, four or five in number being taken.

The above method is, for valid reasons, inferior to the one
originated and made popular by the successful results of many
cases operated on by Van Hook. The successive steps are

very simple and the union is not so likely to be followed by a narrowing of the lumen of the vessel.

To approach the duct in its upper portion, a lumbar incision several inches in length is made, the same as for the execution of nephrectomy; to reach it in its dependent portion, the sacral route is chosen, first cutting down upon and dissecting out the coccyx, then by pulling the rectum to one side, the ureter is exposed. If the division is not too close to the bladder, the end of the lower segment is ligated with silk, after which a longitudinal incision, about three-eighths of an inch in length is made just below it, into which the lower end of the upper segment is introduced to the extent of a quarter of an inch or more, by a loop of catgut, each end of which is threaded on long, partly curved needles, which are passed through the end of the upper section of the tube and then through the slit in the lower segment of the ureter and made to emerge a little distance below it, when, by drawing up the ends of this loop, the ends of the duct are placed in position, when the traction suture is tied. Next insert two or three sutures of catgut through the peritoneal coats of each organ at the line of union, and if it is possible, a small portion of peritoneum should be made to envelop the line of union and fastened with one or two sutures of fine catgut.

The external wound is closed with silk-wormgut and dressed with sterile gauze pads, which are to be held in place with adhesive plaster or a few turns of a spiral bandage.

Following the operation, a retaining catheter had better be utilized for a few days to prevent distention of the bladder, that indirectly reacts upon the union of the divided ureter, when this occurs near the urinary viscus.

ATONY OF THE BLADDER

Under certain physical conditions there is a want or loss of contractile power in the muscles of the bladder to such a degree that the urinary organ is unable to empty itself; the weakness is not due to a failure of the nerve power, paralysis, but to a pronounced weakness of the muscular fibers. If this physical defect is found at the neck of the bladder there is

usually incontinence of urine; if the weakness is manifest in the muscular fiber of the body of the organ, retention follows.

There is always retention in pronounced cases of paralysis of the bladder with no escape, except from over-distention. In either case the condition should be differentiated from retention caused by obstruction of the urinary outlet.

Atony may be due to several causes, the most common of which are over-distention, prostatic enlargement, cystitis, senility, traumatism, obstruction of the neck of the bladder from urinary calculi, constitutional diseases, and excesses.

The symptoms accompanying atony of the bladder are either incontinence or a feeling of fullness with irritation, caused by retention, in some cases when the body of the urinary organ is the part most affected; in the latter condition the dribbling of urine is mostly caused by the overflow. Retention can be determined by introducing a catheter or by bimanual examination with one finger pressing against the dependent portion of the organ through the rectum, while sudden pressure is made over the bladder with the other hand, thus producing fluctuation.

Treatment: The treatment consists in relieving the cause, whether that be due to disease, excess, or structural wrongs. If there is retention, empty the bladder at regular intervals by passing a catheter, and in the meantime treat the cause by the indicated measures. If due to muscular weakness, small doses of spec. Tr. of belladonna, Nux or Thuja are generally helpful. The following formula usually relieves senile dribbling:

```
R.
    Spec. Tr. Barosma ................................ ℥ ss
    Spec. Tr. Nux Vomica ............................ gtt. v
    Cherry-Laurel Water, q. s. ......................fl. ℥ iv
    M. Sig.—A half teaspoonful every two or three hours, taken
      in a half wine glassful of water.
```

In protracted cases with marked irritation of the viscus, irrigation with quite warm boric acid solution, or witch-hazel, one ounce to a pint of warm water, will prove of marked benefit. The diet in such cases should be free from acid and spices, but nourishing; eschew alcoholic stimulants.

Small doses of strychnia given every three hours and galvanism are usually helpful in atony from over-distention.

Incontinence of urine in early life is frequently due to phymosis and preputial adhesions; relief can not be expected from remedial agents in such cases without first correcting the morbid condition. In females the hood of the clitoris, if adhered, should be reflected back to relieve the irritation of the sympathetic nervous system that usually follows such conditions.

Pyelitis, cystitis and other organic disturbances often follow pronounced cases of atony of the bladder if the cause cannot be relieved. If the cystic weakness be due to calculi, tumors or prostatic enlargement, operative measures only can give promise of any degree of relief.

Good results have followed dissecting free the urethra about one-half inch, in the female, twisting it upon itself one-half to one full turn and suturing it to the adjacent tissue.

ADRENAL TUMORS

Benign and malignant growths of the suprarenal glands are occasionally encountered in the treatment of kidney affections. Of the former class, the cystic tumor is the most common, and sarcoma the most frequently met with in the latter variety. Adenoma is met with occasionally, but is not of common occurrence.

Owing to the close relations of these glands to the kidneys, it is somewhat difficult to arrive at a correct diagnosis in most cases of adrenal tumor and not until an exploratory incision is made down to the kidney will the true condition be revealed.

In the early phases of the disease, there are no marked diagnostic symptoms; not until the growth assumes a sufficient size to produce pressure distress, will the morbid condition impress its seriousness on the mind of the patient; at this period in the progress of the disease, a fullness will be observed in the dorsal region and the patient will complain of discomfort, whether lying down or standing. In pronounced cases, the encroachment upon the thoracic viscera interferes ofttimes with the respiratory function.

The disturbance to the sympathetic nervous system is evinced by periods of nausea and vomiting and in some instances, pronounced prostration.

Treatment: The treatment of growths of the suprarenal gland, especially those of a cystic nature, is by excision, when feasible, or incision and drainage when removal is contraindicated. If the latter course is adopted, the margins of the cyst-wall are sutured to the external wound with catgut and the latter dressed and re-dressed with sterile gauze pads, held in place with plaster strips or an abdominal bandage. The malignant tumor will require the removal of the entire kidney and gland.

CYSTIC DEGENERATION OF THE KIDNEYS

Not infrequently the kidneys undergo degeneration through the formation of cystic growths, to the extent that the organs are crippled in their function, endangering the life of the patient.

There are several forms of cystic growths recognized by surgical writers, chief of which are the **simple,** or **serous cyst,** which usually results from simple inflammatory action and contains a light straw-colored fluid, which is sometimes slightly blood-stained; the **dermoid cyst,** so called because of its lining cyst-wall resembling true skin and its containing serum in which float large quantities of epithelial cells and other detritus, is sometimes met with, but is not of large growth and its development is generally slow; the **echinococcus cyst** is due to the presence, in the kidney, of the parasite **echinococcus hominis,** and often develops to a large size; and besides the varieties mentioned the kidneys are often attacked with multiple cystic disease, wherein the stroma of the organ contains numerous cysts filled with a clear serum.

The morbid state is usually chronic, and is often devoid of symptoms, except in cases where the growth assumes a considerable size, when more or less pain is experienced through pressure.

The causes leading up to the formation of cyst in the kidneys are often obscure, although the morbid condition is occasionally met with in connection with other organic diseases of

the renal organ. The little growths are to be found throughout the stroma of the organs, and in childhood and adult age the polycystic variety; while the echinococcus cyst usually observed in early adult life may attain a size capable of holding a pint or more of fluid.

The urine may show normal upon examination in mild cases, except the specific gravity is usually low, and often unchanged in color, while both albumin and blood are often found in chronic cases where pain has been a feature, resulting from pressure or destruction of the organ. As a general thing both kidneys are alike affected, the disease usually progressing until a fatal issue terminates life from uremic convulsions.

A free flow of clear urine of low specific gravity, containing more or less albumen, is a characteristic feature of the disease, and when present in the absence of symptoms of other grave constitutional affections the diagnosis of cystic disease of the renal organs is almost certain, especially if upon palpation the kidneys show marked enlargement.

Treatment: So far as giving relief or bringing about a cure with remedial agents is concerned, much depends upon a correct diagnosis at the outset of the morbid state, and then only in mild attacks, with great resisting power on the part of the patient, need a cure be looked for. The following prescription will prove of benefit in cases marked with irritation and tenesmus:

℞.
 Spc. Tr. Agrimonia .... ℥ iij
 Spc. Tr. Eryngium .... ℥ j
 Peppermint Water, q. s. ....fl. ℥ iv
 M. Sig.—A teaspoonful every two hours.

In alternation with the above mixture the patient should take from five to ten grains of lithia, in a half-glass of water, every three hours.

In cases of some time standing methylene blue should be substituted for the lithia; the remedy being administered in one-grain doses every three to four hours in pill or tablet form, with plenty of water after it. The action of this potent remedy upon the urine had better be explained to the patient when the prescription is given him, so that he will not think harm has

been done him when he first observes the change of color in the urine voided.

Advanced cases can only be kept comfortable with medicinal agents, the symptoms being relieved as they arise. Surgical measures may bring pronounced temporary relief, but only should be made use of as a last resort, the ultimate outcome being fully explained to the patient before the work is executed.

EXPOSURE OF THE KIDNEY

To expose the kidney for diagnostic or operative purposes, surgeons make use of several forms of incision, each having some merit to commend it. The **posterior vertical incision**, as done by Prof. Edebohls, is the one safe and common method very generally practiced by surgeons today. It is executed as

Fig. 398.—Patient in position, and line of incision shown in operation on the kidney.

follows: With the patient properly prepared and placed under an anæsthetic, he should be placed upon the operating table, face downward, with a pillow, sand-bag or inflated rubber cushion beneath the abdomen (See cut). An incision of suitable length should next be made along the external border of the erector spinæ muscle, dividing skin, superficial fascia, latissimus dorsi, and lumbar aponeurosis. This brings us to the retroperitoneal space, which is opened and the kidney exposed by dividing the overlying fat, which will generally be found to consist of two layers, separated by a thin perinephritic fascia. By

carefully separating the divided structures, the last dorsal and iliohypogastric nerves will be exposed and unless bound down by inflammatory adhesions, the kidney can be pulled out through the external incision, if need be, for further examination.

To explore the ureter or to perform operations upon the same, as well as to operate on the kidney, these organs should be exposed through an oblique lumbar incision, which is made while the patient occupies the Sim's position with the rubber cushion previously mentioned, placed under the healthy loin. An incision some five inches or more in length, is then made through the overlying soft structures, commencing over the junction of the sacrolumbalis muscle with the last rib, and entend obliquely forward to a point near the anterior spine of the ilium. Fat and muscular tissue extending in the direction of the incision can be separated by blunt dissection, rather than to cut across the fibers which weakens the muscle in all cases. If morbid conditions of the kidney or ureter require a larger opening, the lines of incision may be extended from the lower extremity of the first incision, forward and upward, toward the umbilicus or the original incision may be extended downward, parallel to Poupart's ligament, dividing all of the soft structures down to the peritoneum; either method of procedure will make the retroperitoneal space quite easy of exposure. The character of the work to be done will decide which of the methods of exposure should be chosen in every case.

IMPLANTATION OF THE URETER INTO THE BLADDER

Implantation of the distal end of a divided ureter into the bladder wall is required when the urinary duct is accidentally severed so close to the urinary viscus that a utero-ureterstomy cannot be accomplished. The successive steps being considered, the grafting of the severed end of the ureter into the bladder is much easier of execution than is that of anastomosis of the divided ends of the urinary duct

The implantation may be executed by two methods, intraperitoneal and extraperitoneal, the former course being preferred on account of its being safer, and the operation being easier of execution.

Treatment. In performing this operation, several important matters should be taken into consideration. First, care should be taken not to make the opening in the bladder wall, into which the severed end of the ureter is to be sutured, too low down, that regurgitation may be prevented; secondly, in placing the sutures, which should be fine silk, in the peritoneal surfaces of the ureter and bladder wall. To secure union, the surgeon should be cautious not to narrow the lumen of the ureter, otherwise constriction will follow, which will cause more or less trouble by distention of the uriniferous duct and checking a free flow of the urine into the bladder, and then the bladder should be raised high enough in the pelvis and fixed to some of the existing ligamentous structures with silk sutures that traction upon the united organs may be prevented after they are joined together. Some surgeons recommend that the end of the ureter to be implanted should be split a short distance before it is inserted through the bladder puncture, which should be made in an oblique manner; this is to prevent constriction and a return flow of urine.

The end of the ureter to be implanted into the bladder wall is placed in position by a loop of catgut passed through the end of the ureter by means of a long partially curved needle, to which the ligature is threaded; next thread the other end of the ligature in a needle of the same size, and pass both needles through the small punctured incision in the bladder wall, and made to emerge a half inch or so from the opening and on a direct line with it; by drawing on these loop ends, the end of the ureter is drawn into the bladder the necessary distance, and the ends tied. Next introduce three or four interrupted catgut sutures at the junction of the two organs, after which a fold of omentum should be fastened about the line of union, if this is possible.

If after careful inspection, every step in the operative procedure is found to be faultless, the abdominal wound is closed in the usual manner, after which the patient is placed at rest in bed.

In the extraperitoneal method, the ureter and base of the bladder are reached by the sacral route, first removing the coccyx, exposing the rectum, which is held to one side with a broad retractor.

URETHRAL CARUNCLE

Urethral caruncle is a polypoid growth usually found near the external outlet. The growth is generally pedunculated, the presenting part is reddish in color, and is very vascular. In text-
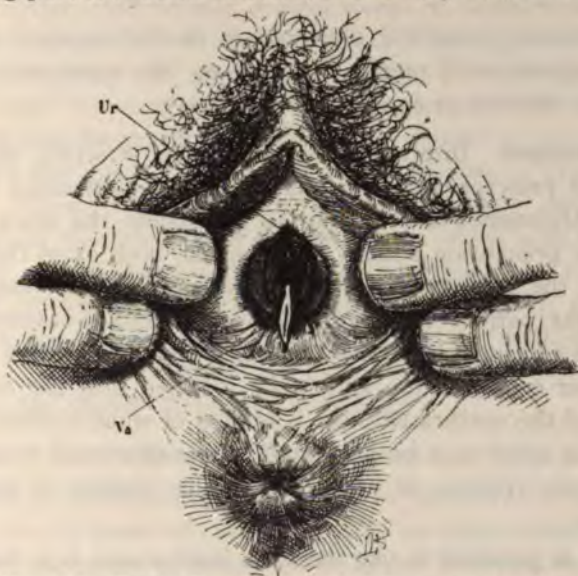
Fig. 399.—Urethral caruncle. *Ur*, the external orifice of the urethra; *Va*, the vaginal outlet. (After *Kelly*.)

ure it is composed of soft, fibrous tissue. It is frequently observed hanging from the urethral orifice by a slender pedicle. It is usually painless, except when irritated by rough undergarments or inflamed from specific urethritis. Some discomfort is felt while the bulk of the growth is blocking the urethral canal during the voiding of urine.

As the little growth emerges from the urethral orifice, it sometimes resembles a fold of redundant urethral mucous membrane, from which it should be differentiated.

Treatment. The treatment for the removal of the morbid growth is entirely surgical. After rendering the urethra aseptic, the slender pedicle is grasped with a pair of hemostats and crushed and then severed with scissors, or the pedicle, if very vascular, may be ligated en masse or in halves with a silk ligature and the small tumor cut away with scissors. The growth seldom, if ever, returns after its removal.

URETHROTOMY

Partial or complete obliteration of the urethra, resulting from stricture, will require opening up the contracted portion, either by internal or external urethrotomy.

Treatment. Internal division of the stricture should be given the preference, when it is possible to introduce either an Otis or Maisonneuve urethrotome to execute the work. Every antiseptic precaution should be observed, both as to the preparation of the patient and the sterilization of the instruments. Unless the patient is very nervous and unduly exercised, the operation can be done under cocaine anæsthesia; a few drops of a four per cent solution should be instilled into the contracted portion of the urethra through a section of small catheter, or the deadening agent may be placed along the strictured track with a hypodermic syringe, in cases where the urethra is nearly impervious.

If it is possible to use the Otis instrument, it is well lubricated with sterile oil and introduced within the urethra, after it is thoroughly cleansed; the extremity concealing the blade is carefully forced beyond the contracted portion. The thumb-screw is now turned slowly, separating the parts composing the instrument, which makes the strictured portion reasonably tense. The knife is now withdrawn a sufficient distance to divide the contracted portion freely and to the depth required. The knife is then replaced in the extremity of the shaft by pushing forward on the expanded portion of the rod supporting it. The urethrotome is again expanded before it is withdrawn to insure that the stricture is sufficiently divided; if it is not, the cutting

process should be repeated. If other strictures exist they should be treated in like manner until the entire length of the urethra is made of uniform size. There is little danger of dividing the mucous membrane, other than the strictured portion, especially if the graduated dial at the outer end of the urethrotome be properly set at the commencement of the operative work, as the caliber of the normal urethra is much larger than the contracted portion.

There is usually but little hemorrhage following the division of strictures, but in cases where it is free from the division of one or more small vessels, a steel sound or catheter should be passed and the penis bandaged to it with a light gauze bandage. If the hemorrhage still persists, ice should be held against the perineum and that portion of the penis adjacent to the incision.

Following the operation, the patient should be kept at rest in bed for a few days upon a mild diet and alkaline or lithia water to slack thirst. The bowels should be kept open with broken doses of sulphate of magnesia. A steel sound should be passed every second or third day, observing that it be first sterilized and lubricated with olive oil or vaseline. If the urine contains much sediment, the bladder should be flushed with a one-half of one per cent solution of permanganate of potash once or twice a day during the period of healing.

External Urethrotomy.

External urethrotomy is advised in stricture of the deep urethra; also in cases of chronic cystitis or other causes where it becomes necessary to drain the bladder. Previous to executing the work, the patient should be prepared as for other surgical operations. He then should be placed under chloroform or ether and made to assume the lithotomy position on the table. The bladder is then flushed with warm boric solution, following which five or six ounces are left in the bladder. The catheter is now withdrawn and a grooved lithotomy staff oiled and introduced through the urethra into the bladder. This instrument is brought up well under the pubic bone, and the shaft, which is placed a little forward from the perpendicular position, is trusted to the care of an assistant, who should hold it firmly with the grooved part looking toward the surface of the perineum. With

the finger in the rectum, which has been previously flushed, the operator can ascertain the location of the staff and the groove. A keen cutting bistoury is next introduced through the perineal tissues, the point of which is made to enter the groove in the staff above the stricture, with the back of the knife turned toward the rectum, as a precaution against wounding that organ. The knife is made to divide the strictured portion by forcing it forward, and on into the bladder, if for any reason it is found necessary to open up that organ.

Before incising the perineum, the penis should be well extended on the shaft of the lithotomy staff and the scrotum should be turned upward and held by the assistant that supports the staff.

If for any reason it is found impracticable to plunge the knife through the perineal tissues en masse, they may be di-

Fig. 400.—Otis bougies.

vided layer by layer until the stricture is reached, which is then incised while the margins of the perineal wound are held apart with retractors. Caution is at all times exercised to keep in the median line when incising the perineal tissues to avoid wounding important vessels and other adjacent structures, especially the bulb of the urethra.

When extending the incision on into the bladder, it is good surgery to introduce a grooved gorget or director along the lithotomy staff into the viscus before withdrawing the staff. The operator then forces the index finger carefully through the neck of the bladder along the line of incision, thus opening up the strictured track by forcible dilation, lessening the chances for hemorrhage and severe nagging pain in the penis that is so frequently experienced in external urethrotomy. As soon as the bladder is opened up by incision or dilation, the boric so-

lution previously left in the viscus rapidly escapes. The organ should be well flushed, and a large sized male catheter introduced through the strictured portion into the viscus, for an inch or more, and secured to the margins of the perineal wound with a silk-wormgut suture. A suture can now be placed through the
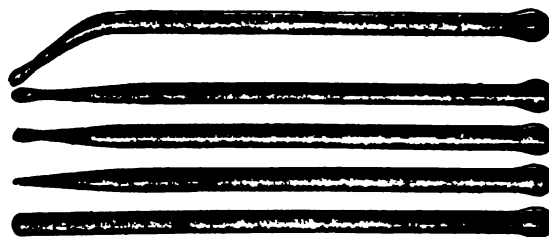
Fig. 401.—Urethral bougies, with which stricture of the urethra is determined.

margins of the wound on each side of the catheter, using silk-wormgut in preference to catgut. The traumatism is next dressed with sterile gauze held in place with a T-bandage.

The drainage tube is to be left in place a few days, when it can be removed, allowing the perineal wound to heal, during
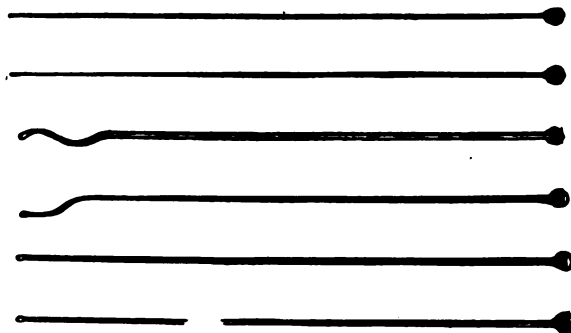
Fig. 402.—Filiform bougies.

which time a steel sound of good size should be passed through the urethra and into the bladder every two or three days, to insure a uniform size of the previously contracted portion of the uriniferous duct. With no complications, the wound should be healed in ten days to two weeks, but the sound should be passed once or twice a week over a period of a month or two.

External urethrotomy without a guide is a much more diffi-cult operation to perfom than where some form of staff or director can be introduced and followed. It is sometimes possible to coax a filiform bougie through the strictured portion of the urethra, when a larger instrument would be unavailable. If the stricture is impervious, a grooved sound is introduced until it engages the fibrous obstruction. As in operation with the staff, the perineal structures are divided layer after layer until the end of the staff is reached. By retracting the divided tissues, it is pos-

Fig. 403.—Through a perineal incision the grooved director is made to follow the course of the constricted urethra. (*Howe.*)

sible to bring into view the opening into the structure; if so, a filiform bougie may be made to traverse the contracted and tortuous track by grasping the tissues near the opening with a pair of narrow beaked hemostatic forceps and extending or straightening the strictured portion. In this case, the filiform will serve as a guide through the stricture; otherwise, the most satisfactory plan is to do a suprapubic cystotomy and pass a suitable-sized guide into the urethra from within the bladder and forward until it engages the stricture, thus making it pos-sible to locate the posterior urethra, which, when properly opened up, will greatly aid in dividing the contracted portion.

It is of the utmost importance to introduce the guide along the urethra before attempting to open it up, as otherwise the membranous portion is most difficult to locate. False passages and an abnormally placed urethra will be readily determined by the introduction of the guide by the bladder route.

To do a suprapubic cystotomy the patient should be first aseptically prepared, anæsthetized, and placed in the Trendelenberg position. The abdominal walls are divided in the median line, the incision commencing at the symphysis and ex-
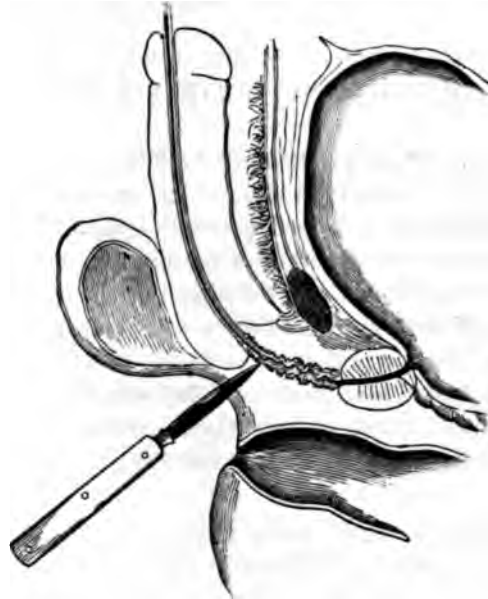
Fig. 404.—Cutting down to a strictured portion of the urethra, using the end of a small sound as a guide. (*Howe.*)

tending upward three inches or more, as may be required to readily reach the urinary viscus. The readiness by which the bladder is reached will depend in a measure on the amount of urine the organ contains: if there be but a small amount, the bladder will be found lying very low behind the pubic bone, and will have to be grasped with forceps and carefully pulled up into the abdominal wound, where it is incised.

At the conclusion of the operation on the urethra, the wound in the bladder is closed in the usual way, with a row of sutures

of fine silk or catgut placed with a fine curved needle, passing through all the coats of the bladder wall excepting the mucous membrane, bringing the edges of the wound accurately together. If these sutures are properly placed there is little danger of escape of urine, especially while the bladder is drained through a catheter introduced through the urethra. The external wound in the abdominal wall is closed with sterile catgut or silk-worm-gut and dressed with sterile gauze and a bandage applied. The perineal wound will heal in ten days to two weeks and the urine will be voided through the urethra in the normal manner.

RETENTION OF URINE

Inability to empty the urinary bladder or to partially do so may arise from various causes, chief among which may be mentioned paralysis, enlarged prostate gland, fecal impaction, hysteria, spasmodic contraction of the muscles at the neck of the bladder, the presence of foreign bodies in the viscus, traumatism, the presence of tumors occluding some portion of the urethral tract, and the drastic action of such drugs as the opiates, cantharides, and belladonna and its alkaloids. Urethral stricture is also a common cause of retention, especially when the morbid condition is made worse by imbibing alcoholic beverages to excess.

The symptoms, which come gradually, are an urgent desire to urinate, an increasing fullness in the hypogastric region, dull pain with tenesmus, restlessness, rupture of the bladder if not relieved, followed in most cases by peritonitis and death.

Treatment. The treatment of this painful condition will depend largely upon the exciting cause. Both medical and surgical measures may be employed, with every promise of relief and cure of the morbid condition. If the retention is due to congestion, spasm of muscles from irritation or inflammatory action, prompt relief will follow the application of hot fomentations, composed of hops and stramonium leaves wet with vinegar and water, to the hypogastric and perineal regions. One fourth grain of morphine or heroin administered hypodermically

will prove of value in cases due to spasm, especially if the patient is given a hot hip-bath in connection. The following prescription will also prove of value in such cases as are referred to above:

R.
    Spc. Med. Veratrum Vir. ....3 ss.
    Spc. Med. Gelsemium ....3 ij.
    Camphor Water, q.s. ....fl. 3 iv.
M. Sig.—For an adult, one teaspoonful every thirty minutes
    till four doses are taken, then a half teaspoonful in a little
    water till urine can be voided. Children should take half
    the above quantity.

A rectal enema of a pint of hot starch water, to which ten or fifteen drops of tinct. of opium is added, will often relax the spasm of muscles causing retention; suppositories containing a quarter grain of opium may do as well, but are slower in action.

To give immediate relief to an over-distended bladder, a catheter should be introduced, through which the urine escapes; if this be impracticable on account of the presence of a stricture, tumor, or rupture of the urethra, the bladder should be tapped with a curved trocar and canula, either through the rectum or immediately above the pubes. If the latter course is chosen, the puncture may be preceded by a hypodermic injection of a few drops of a four per cent solution of cocaine. A puncture through the skin is made with the sharp point of a bistoury, and through this puncture the trocar and canula are thrust. On the withdrawal of the canula, a small piece of adhesive plaster is applied over the punctured wound, to prevent infection from external sources.

Tumors will require removal, as will an enlarged prostate gland. Old, indurated urethral strictures will need incising or dilating when possible. Foreign bodies in the bladder or urethra should be removed as soon as their presence is determined, through a perineal incision if in the bladder, by external urethrotomy if the obstruction is in the urethra. Following the operation, the bladder should be washed out once or twice a day with warm boric acid or weak permanganate solution.

If the retention is due to a hysterical state of mind, the treatment will have to be along moral and hygienic lines as well as by medicinal measures. If the physical state of the body is be-

low normal, the cause should be determined and corrected, the patient should be urged to exercise in the open air and then diet should be rich and nourishing. The patient should not only attend amusements, but should court the society of happy and entertaining persons. A catheter may be introduced once a day in these cases with advantage.

INCONTINENCE OF URINE—ENURESIS

Incontinence of urine is an affection incident to childhood, although it may occur at any period in life, from certain morbid states of the bladder.

Nocturnal enuresis in children is due to intestinal worms, reflex nervous troubles, malformations, and the lack of will power.

The morbid state occurs in the adult as a result of irritability of the bladder, caused by the presence of calculi or other foreign bodies, tumors and malformations, adhered prepuce, impacted urethral calculi, paralysis, prostatic enlargement, stricture, phymosis, and as the result of traumatism; low forms of disease have been known to so reduce the vitality of the system that incontinence in a marked degree, persisted for months and even years.

Injuries to the urethra and neck of the bladder during childbirth have resulted in protracted periods of incontinence that often required a resort to surgical measures to bring relief.

Treatment. The first step in the line of treatment of the morbid condition is to determine the exciting cause. When due to lack of will power, as it is in very young children, proper training on the part of the parents in teaching the child to control the evacuation of the bladder will soon remedy the defect. Sulphur internally and rectal injections of salt, quassia, or aloes solutions in proper strengths, will cure when the enuresis is due to intestinal parasites. Structural defects and reflex disturbances usually call for surgical intervention as does the presence of calculi or other foreign bodies within the bladder or uriniferous ducts. Weakness of muscular structure of the bladder walls

usually improves under massage and the stimulation obtained from the use of electricity. Irritability of the bladder will call for gelsemium, cantharis, plantago, staphisagria, and acetate or citrate of potash if the urine is decidedly acid.

The following compound will produce good results when the incontinence is due to congestion of the neck of the bladder resulting from long existing irritation:

R.
    Spc. Tr. Belladonna ....gtt. xv.
    Spc. Tr. Saw Palmetto ....ℨ ss.
    Cherry Laurel Water ....ℨ iij.
    Aqua Dest., q.s. ....fl. ℨ iv.
    M. Sig.—A teaspoonful every two or three hours.

The above prescription may be increased or diminished in strength to suit the individual case.

When the affection is due to nervous or hysterical states of the mind, rest in bed for a short period of time, with moderate doses of potassium bromide, will soon bring good results. The habits of the patient as regards sleeping and eating, if found at fault, should be regulated; he should not retire early or sleep under heavy covers. Resting on either side should be preferred to sleeping on the back. Voiding the urine after certain periods of time day or night should be encouraged.

Retention or distention, resulting in incontinence, will require the use of the catheter, not only to empty the bladder, but to irrigate the viscus once every day or two, especially when the retention is due to paralysis. A two per cent solution of salicylic acid and borax, or a one per cent solution of carbolic acid, being used for the purpose.

TRAUMATIC INJURIES TO THE PERINEAL REGION

The perineal tissues are subject to a variety of injuries, notwithstanding the fact that the perineal region is anatomically well protected. The most common injuries to which the perineal structures are liable are lacerated, contused, and punctured wounds; next in order are wounds by incision, produced by the

surgeon when operating for the relief and cure of urethral stricture, perineal abscess, tumors, vesical calculi, and for the removal of foreign bodies inserted in the urethra that find their way into the deeper portion of the urinary canal.

Lacerations of the perineum are usually produced during difficult labors by a too rapidly presenting head, or by instrumental deliveries. The traumatism may be slight, merely dividing the integument and fascia, or it may lacerate the sphincter muscle and the deeper tissues, which may take place without separating the overlying integument. In the latter case, the patient complains of a dragging pain throughout the floor of the pelvis, and a sense of loss of support to the pelvic organs. In aggravated cases, there is likely to be a rectocele, a rolling outward of the posterior vaginal wall; or a cystocele, a protrusion of the anterior vaginal structure.

Lacerated injuries are usually remedied at once by primary perineorrhaphy. If, for any reason, the plastic operation cannot be done within a few hours following the injury, it had better be deferred until the wound has healed by cicatrization, when the torn edges should be cut away and joined together by silkwormgut sutures, care being taken to include sufficient tissue with the suture to prevent it from cutting out before the healing process is complete.

A contused wound of the perineal structures, if severe, is an injury that frequently leads up to serious complications, especially if the urethra be extensively bruised or lacerated. In this case, abscess formations are most sure to follow, with extravasation of urine, more or less septic infection, the morbid state finally terminating in a traumatic stricture, or if not remedied through the operative procedures a urethral fistula finally results. This form of injury is generally caused by falling astride of some hard structure, as a scantling, joist, or rail, and it may also be produced by a kick in the perineum.

The symptoms following a contused wound of the perineal region are heat, pain, and swelling, with a heavy, dragging sensation, and acute tenderness on pressure. Added to these symptoms will be more or less ecchymosis of the perineal tissues and the escape of blood from the urethra when this excretory canal

is abraded. The patient will be unable to empty the bladder, and every effort to accomplish this purpose will likely force a small amount of urine into the bruised tissues, causing irritation and pain. Efforts made to pass a catheter usually prove futile, and unless great care is exercised the probing provokes active hemorrhage. The passage of the instrument into the bladder will be followed by a free flow of urine, unless the eye of the instrument becomes plugged with a clot of blood while passing the injured portion of the canal; should no urine escape, and to determine that the instrument has not been forced through the rent in the urinary passage, a small amount of boric solution should be gently forced through the catheter to liberate any obstruction that might block the entrance. Should no urine follow this procedure withdraw the catheter part way and make other efforts to pass it; in case of failure the patient should be prepared for perineal section.

Treatment. A free incision is made in the median line of the perineum to the extent of three inches down through the soft structures upon a grooved staff, if one can be passed by the traumatic injury into the bladder, otherwise upon the obstructed end of the guide, thus exposing the seat of the laceration in the urethra, and at the same time, the traumatic area can be freed from pent-up fluids and blood clots. If now the proximal end of the urethra can be discovered, it should be secured and a catheter passed through it into the bladder and fastened with strips of adhesive plaster.

If the rupture in the urethra be only partial or incomplete, the rent may be sutured over a pure gum catheter that has been previously introduced into the bladder. For this purpose, silk or catgut should be used; the former should be given the preference, as catgut is soon absorbed, especially when placed in tissue infected with urine. The overlying structures are approximated and sutured with silk-wormgut. The catheter should be left in place for a week to ten days, giving the rent in the urethra time to heal. In introducing the fine silk sutures in the margins of the rent in the urethra, care should be exercised not to include the mucous membrane, but the sub-mucous tissue only. To prevent cystic disturbance, the bladder should be flushed once

or twice a day with a ten per cent solution of boric acid while
the catheter remains in place. The scrotum should be elevated
to prevent infiltration, and an occasional hypodermic dose of
hydrochloride of heroin near the traumatism, if needed to as-
suage severe pain, is commended. After the removal of the
catheter, a medium-sized sound should be carefully passed every
two or three days to prevent stricture and to insure an urethral
passage of normal caliber. In extensive injuries to the perineum,
where the repair must be by granulation, a lead or silver catheter
should be inserted into the bladder and secured for a week or
two, to prevent cicatricial stenosis, care being taken not to ex-
tend it too far into the viscus.

Simple abscesses, resulting from a bruise in the perineal
region, are not commonly met with, but should they occur they
should be incised early, the cavity thoroughly irrigated with a
ten per cent boric solution, lightly packed with sterile or medi-
cated gauze, dressed antiseptically, and the patient enjoined to
rest in bed.

Punctured wounds in the perineal tissues are not infrequent-
ly met with. The results following this form of injury depend
largely upon its depth and the importance of the textures compli-
cated in the traumatism; also on the character of the instrument
making the wound. This form of injury is most frequently re-
ceived by falling upon some pointed object, as a spike, fork-tines,
wooden pegs or stakes such as are seen on the corners of hay-
racks. A most serious punctured wound of the perineum was
observed by the writer in a man, who, sliding from a load of
hay, was impaled on a sharp-pointed corner stake in a rack the
kind above referred to. The depth of the wound was about three
inches, and in its course the end of the stake nearly severed the
prostatic portion of the urethra, besides carrying into the tissue
shreds of the garments worn. Punctured injuries are always
deeper than their external width would indicate, and the pain
that follows this form of wound is usually most severe. Active
hemorrhage is not a feature of punctured injuries, unless import-
ant blood vessels are severed. Septic infection and abscess for-
mations are common results.

The treatment of punctured wounds of the perineum, as in
other regions, requires that the traumatism be freed from all

foreign matter, the control of inflammatory conditions by the application of hot fomentations of hops and stramonium leaves, contained in a gauze bag, and kept wet in a hot solution of witchhazel and water, or absorbent pads wet in a hot solution of the alkaline mixture. If there is any doubt of the wound having free drainage, the punctured track should be laid open by incision, and at the same time the ends of bleeding vessels should be picked up and ligated if they have been severed during the injury. The after-dressings should consist of potent antiseptic washes and an occasional dose of heroin hypodermically administered, if the patient be in much pain. The patient should be put to bed and quiet enjoined; the bowels should be kept open with broken doses of sulphate of magnesia or enemas of glycerine and warm water, to which a half drachm of spirits of turpentine may be added to aid in expelling gas and controlling passive hemorrhage. This form of injury to perineal tissues should be allowed to heal by granulation.

Perineal section is often resorted to for the relief and cure of urethral stricture and for the removal of vesical calculi and tumors found developing in the perineal region. These wounds are usually made under strict antiseptic precautions and heal readily without suppuration, except perhaps where there is a considerable loss of tissue, when the healing progresses by granulation or secondary intention. This is accomplished by the wound spaces filling in with lymph, serum, and blood, forming a semi-solid fluid, into which is deposited connective-tissue cells escaping or thrown off from the margins of the incised wound; to complete the tissue formation, the developing tissue fluid is fortified with the round and epithelioid cells, which with the addition of the endothelium of the vessels, the cicatricial formation is accomplished.

It is frequently found necessary to cut down through the perineal tissue and into the urethra for the removal of foreign bodies, such as small urinary calculi that find lodgment in the membranous urethra, and sections of a broken catheter that can not be otherwise extracted. The after-treatment of this form of injury will be the same as that recommended following incision for urethral stricture.

TUBERCULOSIS OF THE BLADDER

It is possible for tuberculosis of the bladder to occur as a primary lesion, although it appears as a secondary infection, as a general rule, it being an extension from some adjacent organ, as the kidneys, prostate gland, and epididymis. If the morbid condition is due to extension of the disease from one of the kidneys, that portion of the bladder surface surrounding the orifice of the ureter is first infected, the mucous membrane first becoming studded with small tubercle, which often excites inflammatory action, causing a degeneration of the morbid material, which later breaks down into ulcers that have little or no disposition to heal under any form of treatment. At this stage of the disease, there is more or less tenesmus and pain and a desire to urinate frequently; the urine voided is usually cloudy, the last ounce or two containing pus, blood, and not infrequently shreds of necrotic tissues. As the disease progresses, the call to urinate becomes more frequent, and the other symptoms mentioned are intensified until the patient is in constant distress.

To differentiate the disease from chronic cystitis, the urinary secretion should be subjected to a microscopical examination, when it may be possible to isolate the tubercle bacilli, after properly preparing the sediment to be examined. If it be possible to introduce the cystoscope, the involvement of the tissue around the urethral orifice in tubercular ulceration may at once be easily determined.

Treatment. The treatment in the early stages of the disease consists in improving the general health by living an out-door life, keeping the appetite keen with peptics and tonics and living on a diet that is both stimulating and nourishing. Of the medicinal agents that will prove beneficial during the progress of the disease, there may be mentioned iron, arsenic, phosphorus, olive or cod-liver oil, and the lime salts prescribed in accordance with the specific indications in the individual case. In advanced cases, especially after the infected area has broken down in ulceration, the urinary viscus should be irrigated two or three times a day with a solution of carbolic acid, one drachm of the acid to the pint

of warm water, or a dilute mixture of the alkaline solution previously referred to under the head of antiseptics.

In pronounced cases of the affection, where it can be determined by the use of the cystoscope that a kidney and its connecting ureter is the primary seat of the disease, a nephrectomy should be advised, as by this method of procedure a cure is often brought about. If this operation is not feasible, or is objected to by the patient, a suprapubic cystotomy, if properly performed, will afford an opportunity to determine the extent of the local infection and the direct application of potent agents to eradicate the disease, if such are demanded by the nature of the morbid condition. While the bladder is open, it should be frequently washed out with antiseptic solutions to prevent, if possible, further destruction of mucous membrane and deeper structures of the bladder wall.

During the time of treatment, the patient should be placed on a diet of rich and nourishing food, and the body should be bathed every two or three days in salt water, after which the skin surface should have a thorough rubbing with a flesh towel.

PARALYSIS OF THE BLADDER

Paralysis of the bladder is not uncommon and is generally due to degeneration of some portion of the brain or spinal cord, or to traumatism of the cord. The extent of the paralytic condition will depend entirely upon the severity of the pathological condition causing it, hence we see cases of complete and incomplete loss of function of the viscus with difficulty in urination or retention, with sometimes an overflow or incontinence of urine.

Individuals suffering from paralysis of the bladder, with dribbling of urine, are obliged to wear a rubber urinal, strapped to the waist and inner side of the thigh, or evacuate the bladder every three or four hours with a catheter, being cautious not to use the instrument without first thoroughly sterilizing it, less an acute urethritis be provoked, creating a serious complication to the existing affection.

Treatment. Medication effects little if ar
ing power to the weakened urinary viscus,
condition be due to some lesion of the spinal
effect, akin to shock produced by exterr
nitrate of strychnia in one-fortieth grain dos
mically, will prove of benefit by its continued

STRICTURE OF THE URI

Stricture of the urethra is a contraction c
uriniferous duct. This abnormal condition n
more points along the course of the urethra in
be congenital or due to accidental causes.
former, the constriction is generally located in
In the latter, the stricture may be found at
canal, usually with inflammatory changes ii
rounding it.

The accidental or acquired form of stric
scribed as the organic, spasmodic, and infla
as some of the phases of the morbid state c
provoked by some one of these conditions. '
is commonly met with in the male, and may (
and is due to chronic specific urethritis and inj
tal nature, such as may be produced by falling
body, severely bruising a limited portion of t
skin over the injury remaining intact. The in
following the injury are severe local pain, at
position to urinate frequently, with the urine
if it can be voided, and more or less nervous

The straining efforts to evacuate the blad(
ture, in time brings on atony of the bladder,
tion of the expulsive force of the bladder wa
a dribbling of urine. The vesical tenesmus
symptom in urethral stricture is often intense
charge is observed in most of the cases.

Stricture of a marked degree not only i
voidance of urine, but with sexual intercourse

caliber of the uriniferous duct preventing ejaculation of the semen, it later seeping away following the sexual embrace.

Spasmodic stricture often follows operations about the anus and rectum and marked irritation of the bladder and prostate. The morbid state is due to contraction of the muscular fibers of the urethra and is often followed by retention of urine. A feature of the unnatural state is the gripping of a steel sound when once introduced through the contracted portion; in a normal state, the instrument would come away by its own weight, after introduction, if left to itself.

Marked cases of urethral stricture of long standing often aggravate a diseased state of the bladder or kidneys to the extent of producing serious constitutional disturbances, such as uremia with the train of unpleasant symptoms accompanying that disease, and a septicemic state of the blood.

Treatment: Before entering upon the treatment of urethral stricture, a complete history of the case should be obtained from the patient relating to the cause of the ailment, the urine examined for pus, blood, and tube casts and the urethra explored with graduated sounds to determine the permeability of that duct. With information thus gained the surgeon will be in a position to prescribe a proper course of procedure.

If the stricture is recent and soft, it may be cured by gradual dilation under cocaine anæsthesia, using conical bougies, graduated in size and made from steel or hard rubber. Before attempting to introduce these instruments, the urethra should be cleansed with warm boric solution, and the canal again irrigated, following the treatment, which should be repeated every second or third day, unless a feverish state of the system is provoked by the procedure, which would, if present, require a longer period between efforts at dilation, at the outset.

The majority of cases will require from two to three months to establish a cure, depending, of course, upon the condition of the constriction to be overcome. After the first month, the patient should be allowed to pass the sound, which should be done two or three times a week and always observing antiseptic precautions to prevent exciting urethral fever.

This form of treatment is to be preferred in diseased conditions of the urinary track, advanced diseases of the heart and lungs, and in enfeebled conditions of the system, whether resulting from disease or old age.

In the absence of inflammatory conditions, the stricture may be at once overcome by the use of Howe's triangular pointed divulser. The flattened end of the handle will indicate about where the point of the instrument engages the stricture, and there is little danger of making false passages through the urethra, if the penile appendage is well extended upon the instrument while it is being introduced.

In cases where the stricture is pronounced, rendering the caliber of the urethra small and tortuous, the treatment will have to be commenced with the introduction of filiform bougies, one or more being inserted at the same time down to the stricture, making an effort, first with one and then another, until if possible, one is coaxed past the contracted portion and on into the bladder, where it may be left two or three days, the stricture tissue relaxing in the meantime, permitting the passage of a bougie of larger size. Instead of the bougie, a tunneled catheter is often more readily passed over the filiform and on through the stricture into the urinary viscus, making it possible to execute further operative procedures with greater facility.

Strictures that cannot be relieved and cured by the method of dilation above suggested will have to be treated by external or internal urethrotomy, operations treated of in another part of this work.

PYONEPHROSIS

A collection of purulent fluid in the kidney is called pyonephrosis, and generally results from occlusion of the ureter with a calculus, a blood clot, trauma, kink in the duct, or the presence of a tumor; the resulting accumulation of fluid in the pelvis of the kidney becoming infected with pyogenic germs, gradually causing a degeneration of the stroma of the organ. The extent to which the cystic tumor of the kidney may enlarge will vary in

accordance with the primary cause and the virulence of the septic germs that find entrance into the field of morbid action.

The symptoms are those presenting in morbid conditions of like character. The patient usually suffers a chill, which is followed by fever, hectic in character; periods of sweating, thirst, loss of appetite and strength. Distress and local pain are always present in greater or less degree. If relief is not obtained soon after the kidney breaks down, the patient's features assume a yellowish cast, pronounced physical prostration becomes manifest, soon followed by collapse and not infrequently death.

Treatment: If the patient is seen in the latter stages of the disease and the true condition of the organ correctly determined, it is possible that a nephrotomy will be the only course left for the surgeon to pursue, especially should the patient be found in a condition of marked physical weakness. If the patient survives the operation and later improves in general health, the kidney may be removed, if, in the opinion of the surgeon, this be deemed necessary. The latter operation should be the one advised, if not contraindicated, as a cure of the morbid disease may soon follow. Nephrotomy with drainage can, at the best, only relieve the most urgent condition of the kidney, that of evacuating the pent-up purulent fluid. A septic wound generally remains that menaces the health, if not the life, of the patient.

The successive steps necessary to execute a nephrectomy or nephrotomy are given under the separate articles on these subjects, to which the reader is referred.

The patient's general health should receive attention at the hands of the surgeon, and such supporting remedies advised as will maintain his strength and vigor.

Besides the medicinal treatment administered, the most nourishing and stimulating articles of diet should be prescribed; eggs, beef and milk, koumiss, buttermilk, ice cream, lemon sherbet, game in season, fowl, pickled pig's-feet, graham bread and butter, custards and fruit jellies are admissible in most cases and are taken with a relish.

The morbid disease is a serious one and fraught with complications, which should be met with such remedies or surgical attention as the special features demand.

PYELITIS—PYONEPHROSIS

Technically considered pyelitis is an inflammation of the mucous membrane of the pelvis of the kidney, but considered from a clinical standpoint the mucous membrane is not only inflamed, but the stroma of the gland is often involved. In cases where the inflammatory action runs high, the mucous membrane gives way and suppuration takes place, filling the pelvis of the kidney with pus; this condition is known as pyonephrosis and is a serious complication of the primary affection.

The disease may exist in the acute or subacute form, and the extreme cases are very fatal in their tendencies, at all ages of life.

The etiological factors to be considered are calculi, extension of infectious imflammation from the bladder and urethra, morbid deposits, as tubercle, disease of the ureters, irritant drugs, such as cantharides and turpentine; exposure to damp, cold, and traumatism. It has been known to result from some severe constitutional diseases, such as typhoid fever, Bright's disease of the kidneys, puerperal fever and pyemic states.

As soon as the kidney becomes inflamed, it assumes a swollen state, is abnormally friable, and its surface is often mottled with discolored patches. Great numbers of bacteria are found on the mucous membrane and adjacent stroma in all suppurative cases.

The diagnostic symptoms vary in accordance with the severity of the case. In acute cases there is uneasiness, tenderness, and pain in the lumbar region, which is increased on pressure. Pulse rapid, increased thirst, and fever which is apt to be hectic in character, after degeneration takes place. The urine is highly colored and acrid, and often contains quantities of mucus or mucopus, epithelium, and often red blood corpuscles. In advanced stages of suppuration, the urine becomes decidedly ammoniacal and irritating to the mucous membrane of the bladder and the urethra. After the pelvis of the kidney becomes distended with purulent fluid, the patient will experience rigors, hectic flushes, and digestive disturbances, and if the morbid condition is not soon relieved the system becomes rapidly emaciated, physical exhaustion is marked, and the patient will succumb from the pyemic state.

Treatment: The treatment of pyelitis in the early stages should be remedial, but after suppuration has set in it will of necessity have to be largely surgical.

The patient should be urged to keep quiet in bed, and placed on a mild non-stimulating diet; milk, rice, custards, plain broths, koumiss, buttermilk and eggs, with a little coarse bread, should form a large part of the diet. Water should be drunk freely, especially mineral water; lithia water being given the preference in the acute cases and sulphur springs water in subacute cases.

In the early stages of the disease, aconite, gelsemium, and eryngium, should be thought of: a favorite prescription in such cases is the following:

R.
    Spc. Tr. Aconite ....gtt. x.
    Spc. Tr. Eryngium ....3 j.
    Peppermint water, q. s. ....fl. 3 iv.
    M. Sig.—A teaspoonful every hour.

If the patient is restless and complains of tenderness and sharp pain in the lumbar region, the above prescription can be alternated with the following mixture, with much benefit:

R.
    Spc. Tr. Gelsemium ....3 ss.
    Spc. Tr. Agrimonia ....3 ij.
    Aqua Dest, q. s. ....fl. 3 iv.
    M. Sig.—A teaspoonful every two hours.

In subacute cases, or as soon as pus appears in the urine, the patient should be given five to ten grain doses of benzoate of lithia in capsules every three or four hours during the day, with water after it, alternated with any other indicated remedy. To conserve the patient's strength, he should be put on glycero-phosphate of lime and soda, with drop doses of Fowler's solution three or four times a day. It is claimed by surgeons high in authority that small doses of calomel taken three times a day, last at bed time, will greatly benefit suppurative pyelitis, if commenced as soon as pus makes its appearance in the urine. The author has tried the remedy in several cases with gratifying results.

Suppuration of the pelvis of the kidney can be determined by the presence in the urine of tube casts and pus cells in abundance, and if this evidence is accompanied with pronounced

rigors, hectic flushes, and other systemic disturbances, operative procedures should be determined upon at once. The kidney should be cut down upon and aspirated or incised and drainage established through the lumbar region. For the necessary steps in the latter operation, the reader is referred to the article on nephrotomy.

PERINEPHRITIS

Perinephritis is a term signifying an inflammatory state of the peritoneal envelope of the kidney. It may result from exposure or from traumatism, but the morbid state more frequently results from infection resulting from diseased states, or operative procedures on some portion of the urinary track, or structures in close proximity to the organ.

The prominent symptoms manifest in this affection are pain, tenderness on pressure, and fever, which becomes hectic in character if the case goes on to suppuration; should this take place the overlying tissues frequently become edematous.

The morbid condition must be differentiated from tumors, deformity, and Pott's disease of the spine. This can be done through the history of the case and by exclusion.

Treatment: To control the fever in the early stages and relieve the irritation, the following mixture will be of great benefit:

R.
    Spec. tr. aconite ....gtt. x.
    Spec. tr. jaborandi ....3 j.
    Peppermint water ....fl. 3 iv.
    M. Sig.—A teaspoonful every two hours.

If the pulse be full and bounding, substitute veratrum vir. for the aconite. If the morbid state be the result of infection, give in alteration with the above prescription the following:

R.
    Spec. tr. Macrotys ....3 ss.
    Spec. tr. Echafolta ....3 ss.
    Peppermint water, q. s. ....fl. 3 iv.
    M. Sig.—A teaspoonful every two hours.

The bowels are to be kept open with salines, and the integument over the inflamed organ painted with iodine once or

twice a day, or instead, cups or leeches may be applied. Excellent results have been obtained from the use of hot fomentations of hops and stramonium leaves. The diet should be supporting, but not stimulating; eggs and milk, buttermilk, and ices, are permissible, as are the juices of beef. Water may be drunk freely.

When suppuration has taken place, the purulent fluid may be discharged by aspiration, or by incision and drainage; the latter course is usually the most successful on account of affording an opportunity of exploring the suppurating area with the finger, breaking down any adhesions that may exist, besides liberating sloughing tissue that cannot be discharged through the aspirator. The wound is kept clean with antiseptic washes and closed to a great extent by silk-wormgut sutures.

NEPHROPEXY--NEPHRORRAPHY

Nephropexy is an operation executed upon the kidney after it has been dislocated, the object being to bring about a permanent fixation of the organ to the lumbar fascia or muscles. It is thought by some that a floating kidney is always congenital and that a movable kidney is generally acquired. It is not uncommon for both kidneys to be found in abnormal positions at the same time.

The instruments required to do the operative work are a scalpel, scissors, retractors, hemostats, grooved directors, probes, needles and needle holder, curved ligature carriers, silk, catgut and silk-wormgut for sutures.

With the patient properly prepared and anæsthetized, he should be placed on the table with the sound side resting on an air cushion or pillow, to produce an arching of the side to be operated on. This position will also widen the space between the twelfth rib and the crest of the ilium, through which space the kidney is sought after. An incision is then made from the lower or twelfth rib to the crest of the ilium, some three and a half to four inches forward from the center of the spinal column. The skin, fat and fascia are divided down to the posterior border of the latissimus dorsi; the fibers of this muscular structure are forcibly drawn forward and the underlying tissues either separated or

incised, avoiding, if possible, injury to the sheath of the erector spine and the ilio-hypogastric nerve during the approach to the kidney.

Before incising the transversalis fascia, all bleeding points should be picked up and ligated and the wound cleared of traumatic fluids. The transversalis fascia is then divided to the extent of three inches or more, bringing into view the perirenal fat, which is separated and dissected back from the kidney. The kidney is then brought up well into the external wound, its fibrous capsule incised and each side stripped back to the extent of an inch. The flaps of the renal capsule are next picked up with artery forceps and held well into the external wound, while four or more chromicized catgut sutures are placed through them and the transversalis fascia, or the deep muscular structures adjacent to the organ, and securely tied, which brings the denuded surface of the kidney in contact with the raw muscular fibers of the muscle, to which it is anchored, insuring the necessary fibrous union. The margins of the external wound are then adjusted and closed, layer after layer, with catgut and silkwormgut interrupted sutures.

The external wound should be dressed with sterile gauze pads and a bandage run on. The patient should be kept at rest in bed for three weeks or more on a plain but nourishing diet. For pain that may nag the patient for the first twenty-four to forty-eight hours, following the operation, one-twelfth to one-eighth grain of heroin may be given hypodermically as often as required.

Surgical Treatment of Nephritis

After the usual methods of treatment of nephritis by remedial means have been thoroughly tried and without lasting benefit, surgical measures should be resorted to in such cases as give some promise of relief, if not cure. Decapsulation of the urinary organ, as practiced by Edebohls, in otherwise hopeless cases, has resulted in relieving the congested condition of the kidney and indirectly the pain and distress that often accompany the morbid state. Not every case operated on by the originator of the operation got well, or even obtained relief, but the percentage

of those that did receive benefit was sufficiently great to encourage the operative procedure, so that today it is recognized by surgeons and by the courts as a legitimate operation, and in selective cases the majority of them will get decided relief, if the work is properly executed.

Symptoms suggesting operative procedures in nephritis are persistent headache, puffiness about the eyes, œdema of the face, upper and lower extremities, and ascites; these symptoms taken together with shortness of breath and the presence of albumen and casts, make the diagnosis complete.

The morbid condition of the kidneys is such that decapsulation of both organs is often required at the same time.

For a few days previous to the operation the patient's condition should receive the attention of the surgeon. The bowels should be regulated, the appetite whipped up with stimulants and peptics, salt baths should be advised daily and nourishing fluid foods prescribed.

The principal feature of the operative work is the removal of the capsule of the kidney, which is accomplished after freeing the organ from the surrounding fatty tissue first, and then from the surface of the kidney afterward. The technic of the operation is as follows:

With the patient properly prepared and chloroformed, he is placed prone on the operating table, belly downward, with an air cushion some eight inches in diameter placed beneath the abdomen on a line with the kidneys. With the patient in this position, both kidneys are accessible without further changes. An incision is now made on a line of the external border of the erector spinæ muscle, extending from the twelfth rib to the crest of the ilium; the soft structures are divided down to the latissimus dorsi muscle, which is divided along the course of the muscle with the handle of the scalpel or blunt scissors, avoiding injury to the sheath of the erector spinæ if possible. Care should be taken not to wound the ilio-hypogastric nerve, which is found in or near the transversalis muscle in its course from the quadratus lumborum to the crest of the ilium. After exposing the transversalis fascia, the dense structure should be incised, when the perirenal fat surrounding the kidney is brought into view; this

is separated by blunt dissection entirely around the kidney even up to the pelvis of the organ. This procedure is quite easily accomplished unless adhesions have taken place here and there between the capsule of the kidney and the perirenal fat through inflammatory action; in this case the restraining points will have to be separated with the fingers or scissors.

At this stage of the work, the air bag should be placed higher up under the chest walls, as by assuming this position the kidney, unless anchored at some point below, will at once come up into the external wound, when it can be seized and pulled outside, where it is held while decortication is executed; this is done by dividing the capsule from pole to pole, along its convex surface, on a grooved director, care being taken not to tear or otherwise injure the stroma of the organ, while each lateral flap of the capsule is being stripped back over the organ to the pelvic portion. Each portion of the capsule is in turn cut away with scissors, after it has been dissected back as far as required, leaving a thoroughly denuded organ, which is freed from hemorrhagic fluids and dropped back into its normal position.

In cases where the kidney cannot be delivered through the external wound, the capsule will have to be dissected free from the urinary organ, while it rests near the bottom of the wound, by the fingers, and removed in sections; any portion near the pelvis that can not be cut away should be reflected back toward the pelvis and left. The external wound is then cleared of blood and other fluids and closed, with or without drainage, as the nature of the case will suggest. Both kidneys should be operated on at one sitting if possible, following which the patient should be placed at rest in bed on a diet of koumiss, milk, soups and broths. The bowels must be kept moving with enemas or mild laxatives, and the function of the skin normal, with an occasional sponge bath of salt water or dilute alcohol.

NEPHROTOMY

Incising the kidney for the purpose of exploration, or for the evacuation of purulent fluids and the removal of renal cal-

culi, is a legitimate surgical procedure, and if executed by skillful operators, it is not extra-hazardous to life.

After the field of operation has been rendered sterile, and the patient anæsthetized and placed in a semi-prone position, with the loin made prominent by placing a rubber cushion or pillow under the dependent part of the body, an incision four to six inches in length is made through the skin, fascia, and muscular tissues, extending downward and forward from about one inch below the last rib and along the outer border of the erector spinæ muscle. After exposing the fatty capsule, it should be divided by blunt dissection, exposing the kidney, which is carefully examined for inflamed areas and for fluctuation. Before incising the organ, it will be well to explore any suspicious looking points with a medium-sized exploring needle, for collections of pus, or to locate a calculus, should one be present. If either condition is found to exist, the kidney is incised and the cavity explored with the finger for abscess formations: the pus is evacuated with a scoop or pledgets of gauze, followed by a flushing of the diseased area with a hot bichloride solution, 1 to 5000, or the alkaline antiseptic. The diseased area being freed from all debris, a drainage tube, preferably of rubber, is placed in close proximity to the wound, and even into the kidney in grave cases; as the healing process progresses the tube is gradually withdrawn. The wound should be washed out once or twice a day through the drainage tube for the first week, and longer if the conditions demand it. The external wound is closed with silk-wormgut sutures, leaving only room for drainage. If it be determined that the morbid state is the result of obstruction of the ureter, and its removal be impracticable, the surgeon will have to choose between the removal of the organ and establishing a permanent fistula. If multiple abscess formations are found in the kidney, it is advisable to evacuate their contents through the partition wall with an aspirator, if possible, rather than break down the intervening structure with the fingers, thereby lessening the possibility of troublesome hemorrhage. It is necessary that the patient rest quietly in bed for two or three weeks and be given a nutritious diet. Any morbid phases of the disease following the operative procedure will have to be met as they arise.

NEPHRECTOMY

The removal of the whole or a part of the kidney is frequently resorted to for relief from malignant conditions of the organ, and grave suppurative states following operative measures for hydronephrosis and tumorous growths. If possible, determine the presence and the functional status of the opposite kidney, before removing the diseased organ; this is ascertained by catheterization of the ureters and the known symptoms of diseases resulting from abnormal kidney action. The kidney can be approached through the abdomen and through a lumbar incision; the latter route is preferable in the majority of cases. For examination of the kidney, the former route is the one selected.

The line of incision in lumbar nephrectomy is made at the outer border of the erector spinæ muscle, commencing about one inch below the last rib and extending downward and forward to the extent of four to six inches; divide the tissues down upon the fatty capsule of the kidney, which open by blunt dissection, and enucleate the kidney, first controlling any hemorrhage that might embarrass the operative procedure. If extensive adhesions exist between the capsule and the kidney, making the dissection arduous, separate the kidney and capsule from the surrounding tissues and bring the mass into the wound, aided by abdominal pressure; grasp the mass with the left hand and carefully bring it outside the wound; isolate with care the renal vessels and ligate them with a braided silk ligature; the ureter, which should not be included with the blood vessels, is now picked up and securely held with forceps, when the pedicle is severed with scissors; after due inspection, if the ureter is found in a normal state, the end should be ligated with a silk strand and cauterized; if it is found diseased, it should be cleansed with the alkaline antiseptic, the end surrounded with an envelope of iodoform gauze, and fixed in the lower angle of the wound with a safety pin.

An aneurism needle is a safe and convenient ligature carrier to use in applying constricting mediums to the blood vessels and ureter, and great care should be exercised to securely tie the silk strands and not to sever the vessels too near the ligature. endangering the slipping of the strand and consequent sec-

ondary hemorrhage. Use every antiseptic precaution favoring union of the traumatism by first intention; if the traumatic field be much diseased, it will be well to pack the wound with bichloride gauze, 1 to 5000, for a few days following the operation. This course will necessitate the wound healing by granulation. Silk-wormgut sutures should be used to aid in bringing the borders of the wound together as near as possible.

ACCIDENTAL INJURIES TO THE URINARY BLADDER

The bladder situated as it is behind the pubic bones is quite well protected from external violence, yet it is frequently injured from blows, kicks, stab and gunshot wounds. Stab wounds in the viscus are not alone received through the walls of the abdomen, they may reach the organ through the rectum or the vagina as well. Not infrequently has the bladder been cut into while removing tumors adjacent to the urinary organ, either in the rectum, vagina, or the abdominal cavity. A kick from a horse may fracture the pubic bones and force splinters of the fragments into the bladder, producing an extraperitoneal wound, in which case the urine escapes into the loose tissue surrounding the neck of the bladder, from which it must be drained, or, sooner or later, abscesses will form and slough through into the rectum or vagina or point in the region of the perineum.

To rupture the bladder by external violence, it is necessary that the organ be distended, otherwise it remains in a relaxed and contracted state behind the pubes, which quite well protect the organ from injury. If the walls of the viscus be rendered fragile by inflammatory or ulcerative action, a display of muscular force will cause a rupture of the organ. In a prolonged case of labor the viscus may be impinged between the descending head and the pubic bones for a sufficient period to result in a bruising of the walls, followed later by sloughing.

The symptoms accompanying injuries to the bladder will vary according to the several causes that may produce the traumanism. If the organ be ruptured while distended with

urine, from a display of external violence, the patient often sinks from collapse, and at once complains of a severe and sickening pain in the region of the bladder, there is great tenderness on pressure over the lower part of the abdomen, and a teasing desire to urinate with inability to void urine unless it be but a few drops at a time, and this is usually mixed with a greater or less amount of blood, depending upon the extent of the rent in the walls of the viscus. In stab and gunshot wounds of the bladder many of the same symptoms may be present, but the shock to the nervous system is not usually so marked. By inserting a catheter into the organ the presence of blood in considerable quantity will be determined, although neither urine nor blood may be obtained by the procedure, the rent in the viscus being of sufficient size to permit of the escape of the fluids into the pelvic cavity. Pain and collapse are not marked symptoms of injuries of the bladder resulting from compression and sloughing; the morbid state is more likely to provoke a local inflammatory condition accompanied with rigors and hectic fever.

In cases of intraperitoneal rupture the bladder soon collapses, the urine escaping into the pelvic cavity, where it sooner or later sets up a local inflammatory condition, which later eventuates in a general septic peritonitis accompanied by the characteristic symptoms of that morbid state, viz.: rigors, hectic fever, thirst, distention of the abdomen, restlessness, facial features pinched and worried, and diffuse tenderness over the abdomen.

The prognosis in traumatism of the urinary bladder depends in great measure upon the nature of the force producing the injury, and the extent and location of the wound in the walls of the viscus. In gunshot and stab wounds of the organ the chances of recovery without serious complications are more favorable than in cases of rupture of the wall from external violence, on account of the possibility of the urine escaping through the external wound, thereby preventing in a measure retention and decomposition. Extravasation of urine into the tissues, or pelvic cavity, when mixed with blood and other fluids soon sets up a state of sepsis owing to the virulency of its poison.

Treatment. The objects to accomplish in the treatment of traumatism of the bladder are, first to give vent to the pent-up or extravasated urine by establishing drainage through an incision

into the infected area; the next step, which is the most important, is the closing by surgical measures, the rent, puncture, or incision in the wall of the viscus. Following this measure the next step along the line of treatment will be the prevention if possible of complications, or the proper care of such if they already exist. To accomplish the first step, if the collection of urine be extraperitoneal, under proper aseptic conditions, and the patient placed under an anæsthetic, an incision is made through the skin and fascia over the inflamed and infected area, should the infiltrated urine point in the perineal region or just below the pubes. If the urine escapes through a rent in the serous portion of the viscus and finds its way into the pelvic cavity, the abdomen should be opened without delay, the peritoneal cavity cleansed of decomposed blood and urine with a potent alkaline antiseptic at a temperature of at least 100 degrees F. In women, if the peritoneal infection justifies it, provision for drainage can be made by opening up Douglas' cul-de-sac, through which repeated flushings may be made if conditions call for the further cleansing of the pelvic cavity. A normal saline solution is a suitable cleansing agent to use in recent cases, while cases of longer standing threatened wilh sepsis will demand a more potent remedy. The following formula proves efficiènt in such conditions;

R.
   Biborate of Soda .... 3 iij
   Salicylic Acid .... 3 j
   Boiling Water .... qt. iij
   M. Sig.—Use as a flushing agent in septic states of the peritoneum.

Closure of the wound in the wall of the bladder may or may not be accomplished with ease, the procedure will depend entirely upon the location of the rent, and the ease with which it may be brought into view. If the wound can be reached from the front, in extraperitoneal injuries, the abdomen should be opened above the pubic bones, the wound brought into view, the edges approximated and closed with a continuous catgut suture, care being taken not to include the mucous coat with the stitches. Some surgeons prefer silk for closing the wound instead of catgut, because of its pliability, and forming smaller knots when tied. If the extravasation of urine be extensive in the loose tissue

adjacent to the bladder, provision for drainage must be made before closing the abdominal wound by placing a sterile gauze packing down to the wound with one end presenting outward from the lower end of the abdominal incision. This packing can be left in place for three or four days, or until all danger of suppuration has passed, when it should be removed and the abdominal wound closed.

Intraperitoneal wounds of the bladder are usually difficult to reach, owing to the viscus contracting down back of the pubic bones. It cannot be distended through the urethra, and can only be partially brought into view by introducing a rubber bag into the rectum and inflating it with air, thereby raising the area of tissue immediately beneath the bladder, including that organ, immobilizing it in a way while the rent in its wall is closed. The edges of the bladder wound are first closed by a continuous catgut suture, which should include all the coats of the bladder wall except the mucous membrane, and drawn very tight; a second run of Lembert stitches are then taken, uniting the opposite folds of serous membrane adjacent to the first row of stitches introduced, and burying the same. These sutures should be of silk, including only the serous and muscular coats of the viscus.

All the repair work completed, the rubber bag in the rectum is to be removed, and patient put to bed and kept at rest for three or four weeks. The diet must be light and nourishing after the first four or five days, during which time a few sips of ice cold toast water, iced milk, or corn meal gruel may be taken if the stomach does not reject them.

As a rule the patient is able to void the urine secreted for the first twenty-four to forty-eight hours without the need of introducing the catheter, and if the wound in the bladder has been sutured with care, little fear need be had that leakage will follow the operative work.

TUMORS OF THE BLADDER

Tumors, both benign and malignant, are frequently found in the bladder. Of the benign variety, the villous is most com-

monly met with, the mucous comes next, and the fibrous next in order.

The malignant growths are the carcinoma and sarcoma; the latter being the most frequently met with in persons after the middle period of life.

The mucous and villous tumors spring from the mucous and submucous coats of the bladder and projecting into the viscus, are covered with mucous membrane, giving them a soft external covering.

The malignant growth has its starting point in either the mucous or submucous coats of the bladder, and often develops rapidly into a nodular mass, quite filling the viscus. Again the malignant development may be confined solely to the walls of the bladder, causing marked infiltration of the cellular tissue.

The prevailing symptoms usually present in new growths of the bladder are pain, frequent urination, tenesmus that sometimes amounts to severe spasms of the bladder walls, cystitis, the passage of much mucus or muco-pus, which often contains shreds of broken mucous membrane and sometimes blood. The true condition of the bladder should be discovered early, which is accomplished with the aid of the microscope, cystoscope and by urinalysis.

The treatment for the removal of these growths will have to be by excision through opening up the bladder through the perineum or by suprapubic incision. With the patient antiseptically prepared and placed under an anæsthetic, the bladder should first be irrigated with boric solution, leaving a few ounces in the organ, a lithotomy staff is then introduced through the urethra and into the bladder and the perineum opened up as advised in operating for stone; after the incision is made, the finger is introduced for exploratory and diagnostic purposes; if the growth is found and is within reach it may be removed with the wire snare, or long forceps, breaking it away in pieces, care being taken not to tear the walls of the bladder. If the growth is of large size, the bladder should be opened above the pubes, the edges sutured to the incision in the abdominal wall with silk-wormgut, the wound opened with retractors, exposing the tumor, when it should be excised or broken

down between the thumb and finger and removed in pieces. A drainage tube should be placed in the perineal incision, extending into the bladder through which irrigation is to be made. The wound in the abdomen is closed or left open as the nature of the growth will determine.

The antiseptic solution used for repeated irrigation should be alkaline, of which there is none better than twenty grains of salicylic acid in two quarts of a two per cent boric solution. The irrigation should be done morning and evening for two weeks, or longer in case of malignancy. As soon as the urine drains free from mucus, pus and other morbid matter, the perineal drainage tube should be removed; the urine will soon pass through the urethra normally, if not, a suitably sized catheter should be passed two or three times a day.

Hemorrhage is seldom a troublesome feature of the operative procedure and when present, it can usually be restrained by astringent washes, equal parts of witch-hazel and water, serving a good purpose as such. If the urine contains mucus or pus in any considerable quantity, give a five grain capsule of benzoate of lithia, three or four times a day with half a glass of water after it. Pain is to be assuaged with an occasional dose of one-sixth grain of heroin, administered hypodermically, in the upper part of the thigh. In cases where the vital powers are weak, nitrate of strychnia in one-thirtieth grain doses may be added to the heroin.

EXTROPHY OF THE BLADDER

Extrophy of the bladder is a serious congenital defect, in which the anterior wall of the urinary viscus is wanting, together with that portion of the abdominal wall usually covering the organ. For some unaccountable reason the morbid state occurs more frequently in male than in female children.

The internal surface of the posterior wall of the bladder is brought prominently into view upon examination, the openings of the ureters being noted on either side a little above the pubic bones. Other deformities often are noted in connection with the one mentioned; thus the clitoris may be divided in

the female and some defect in the penis in the male, while a deficiency in the development in the pubic arch is not uncommon. The degree of defect varies in these cases to a notable extent, some merely presenting a small cleft in the median line of the abdomen over the bladder, while others will be observed with many of the defects mentioned above. In the worst cases the morbid condition cannot be remedied by any form of an operation. No vesical cavity existing, the urine as it escapes from the urethral openings, dribbles down over the pubes and external genitalia, making the patient's condition most unpleasant. From exposure to external irritation, the mucous surface sooner or later becomes thickened and very sensitive to the touch and not unfrequently small ulcers appear, which proves a serious complication in all cases.

As before remarked, the worst cases are not amenable to any form of treatment, and surgical procedures alone can give promise of relief even in selected cases, the object sought be-· ing the confinement of the urine to the remnant of bladder left by freshening the edges of the existing wall, in suitable cases, and uniting them with silk or twenty-day catgut. A double row of sutures are required, the skin margins being secured with silk-wormgut, where there is merely a cleft in the wall of the abdomen, making it possible to approximate the margins, once they are properly prepared. In cases where the cleft in the abdominal wall is of a considerable size, the space may be covered in by flaps of skin and fascia taken from the lower abdomen on either side of the cleft, or from the upper part of the thighs. In adjusting these flaps over the gaping space, they are twisted partly around at their base so as to permit of the skin surface being turned inward, forming, when their margins are united to the denuded edges of the gaping cleft, an anterior wall to the urinary viscus. In the worst cases of the defect a much more satisfactory result is obtained by removing the remnant of bladder-wall, after freeing the ureters, and uniting the latter to the upper end of the urethra with iron-dyed silk sutures, after denuding the ends of these conduits of mucous membrane. A urinal of some form must then be worn to collect the dribbling urine, as it escapes from the natural urethra.

ing the organ, but if in doubt as to the presence of excess fluid in the kidney it will be a safe procedure to aspirate the organ.

The accumulation of fluid may distend the kidney to half the size of a human head, causing constant distress from pressure. The patient soon becomes wan and anemic and a loss of flesh gradually follows.

A dislocation of the kidney is a common cause of hydronephrosis causing in most cases a twist or kink in the ureter near the organ.

Treatment: Whatever may be the cause of the collection of the pelvic fluid, this should be removed if possible. If the kidney be found dislocated it should, through operative measures, be anchored to the structures near its normal location : the technic of the operative work is given under the head of Floating Kidney, which see.

Remedies seldom give relief in this trouble, although, if the symptoms point early to hydronephrosis, the patient should be put to bed and kept quiet, and such remedies applied externally and given internally as the nature of the individual case will suggest. Later, if no relief is obtained from medication, the fluid may be aspirated away, which may put the kidney in a position to regain its normal function; if it does not recover this, a pyelotomy may be done and a permanent drainage established, short rubber tubes being preferred for the purpose.

Where the presence of a calculus in the kidney or ureter is suspected, a nephrotomy should be done and the obstructing medium removed, if possible. If this be not feasible, or the ureter be found plugged from malignant disease, the organ had better be removed at once.

PART TWENTY-NINE

Miscellaneous Subjects

SUPPURATION

With a collection of pus within the tissues of the body, we recognize a state of suppuration which is usually caused by local inflammatory action of high degree, a result ofttimes following traumatism. Wherever pus is found, septic germs exist in greater or less numbers.

In all surgical operations it should be the aim of the operator to prevent, if possible, the occurrence of suppuration, and to this end he carefully observes the modern technic advised by the foremost surgeons and others in the preparation of the patient and his care, during and following operative procedures. Being as careful as we may, infection will sometimes follow operations, it seemingly being beyond human power to be perfect in our technic; hence there will always be a certain percentage of suppurative cases to deal with in surgical work, but we should strive to reduce them to the minimum.

Laudable pus is of a yellowish-white color, slightly alkaline, of a creamy consistency, with a specific gravity varying between 1025 and 1030. It is commonly observed on granulating surfaces and in acute abscess formations when the system is otherwise in a healthy condition. Healthy pus is composed of fluid and pus-cells. The former is made up of serum, albumen, oil globules and sodium chloride, and readily coagulates when boiled in a test-tube; the latter are usually globular in form and about 1-2400 of an inch in diameter. These cells contain two or three nuclei which are plainly seen after the cells have been rendered transparent from being subjected to the influence of acetic acid. Pus-cells soon undergo decomposition and take on bacterial infection if left long in an abscess cavity after it has been opened up.

Pus containing blood is generally described as sanious, and ichorous, if containing a good deal of water. If curdy matter is noted floating in the purulent fluid, the indications are that decomposition has set in. If pathogenic germs are found in pus, it is known to be infective, and great care should be taken to prevent the purulent fluid from coming in contact with open wounds.

Wounds and abscess formations found in the axilla, or near the anus and vulva, often contain a dark-colored purulent fluid more or less fœtid in character, and the pus of gonorrhœa is not only infective but greenish in hue, indicating the presence of more than one variety of pus-producing germs. Greenish pus is also observed in chronic abscesses of the brain, and in the medullary substances of bones.

The germs chiefly responsible for purulent states are the gonococcus, streptococcus, staphylococcus, and the bacillus pyocyaneus. The former is incapable of reproduction on culture mediums other than agar-agar and human blood-serum, while the streptococcus and staphylococcus can be cultivated on artificial culture mediums and are easily stained with anilin solutions. The bacillus pyocyaneus is easily stained with the ordinary solutions and develops rapidly at the ordinary temperature on gelatine plate.

There is little difference in the appearance of ordinary mucus and thin purulent fluid, the specific gravity being about the same and both coagulating by heat in a test tube.

The suppurative process may appear in an open ulcer on a free surface, and on mucous membrane, purulent catarrh being a marked example of the latter phase of the morbid condition. Serous membranes may be attacked with the morbid process, as for example, pleurisy, followed by an accumulation of purulent fluid (pyothorax). Abscess formations are typical forms of local suppurative conditions of the tissues, the location of which may be superficial or deep-seated, and are classified into acute and chronic forms, primary and secondary stages, according to the characteristic features of the inception of the morbid state; it being primary if the collection of pus forms at the site of infection, and secondary, if the abscess shows at some distant point provoked by the lodgment of infected material.

The damage that may be done by suppuration will vary with the degree of intensity and the situations in which it occurs. When it follows operations where the large veins are involved general septic infection (septicæmia) has followed the infection of the blood cloth that floats along the vessels in the blood current and find lodgment in some vital organ in the body.

Infection of the liver and portal system may follow operations on the rectum, sepsis being transferred to this region through the hemorrhoidal and inferior mesenteric veins. Pelvic abscesses not infrequently result from operations for varicocele and suppuration of the inguinal glands often follows operations on varicose veins of the leg.

Treatment: The treatment of suppurative states of the body will vary to meet the existing conditions of each individual case. At the outset, the general health of the patient should receive attention, for, as a rule, the physical condition will be found much below the normal state.

Peptics, stimulants and tonics will usually be in demand in cases where suppuration exists, and should be administered to meet prominent indications. Mineral acids and iron will be curative when the tongue shows red and the veins prominent and purple with pale features and in the absence of high fever. Quinine in small doses will relieve rigors and hectic states if taken in the absence of fever. Fowler's solution may do as well in small but frequent doses, especially will this potent agent be of use in chronic suppurative states, with pale, doughy skin, with cold hands and feet, marked physical weakness and night sweats.

Phosphorus and phosphoric acid dilute are indicated in anemia, where the features are pale but full, tongue large and of a leaden color, appetite poor and a decided loss of energy. If the tongue is coated with a pasty white fur, with a sweetish taste in the mouth, salicylic acid, and sulphite of soda are indicated.

General septicæmic conditions will be much benefited by potent doses of spec. tr. echinacea, or baptisa, when the tongue shows a dry brown coating, saliva thick and viscid, and marked typhoid conditions of body. Digestive disturbances will be benefited by wine of pepsin, or lactopeptin, in reasonable doses before and after meals, and some of the bitter tonics between

meals, as hydrastis, strychnia, nux vomica, and small doses of quinia. The lime salts are indicated in tubercular states of the system, where the anemic conditions are marked.

Where the appetite is poor and the system weak, uncomplicated with pungent fever, the morbid condition can be decidedly improved by sipping with the meals, champagne or other sparkling wines, served on cracked ice.

Constipated states of the bowels should be overcome with mineral water, olive oil, a drop of nux in water on arising, phosphate of soda, sulphur, and the salines.

The diet should be composed of such articles of food as will tempt the appetite and aid digestion. Rich soups and beef tea eaten hot, milk, cream, ice cream, oysters, served in various ways, fruits, jellies, pigs-feet jelly and custard, will serve as a list to select from. Rice and cream are nutritious and palatable and so are some of the breakfast foods found on the market.

The action of the kidneys should be kept stimulated and the body frequently bathed in weak salt water. Of the utmost importance is exercise out of doors and in the sun light.

Abscesses, the local manifestation of the suppurative process, are treated under a separate head in another part of this work, hence will not receive attention here.

SEXUAL NEURASTHENIA

A nervous weakness of the sexual organs in the male is occasioned by masturbation, excessive copulation in early adult life, specific diseases, and mental and nervous disorders. The abnormal condition first manifests itself by a cold relaxed state of the scrotum and penis, with infrequent and feeble erections. The patient soon becomes apprehensive of his inability to perform sexual intercourse, the thoughts of which soon cause both anxiety and worry over imaginary affections that may be responsible for the neurotic state. If the morbid state is attended with nocturnal emissions and the urine remains turbid or cloudy, grave diseases of the bladder or prostate are suspected, and through the desire for a betterment of the neurotic condition, the patient is very apt to consult quackish medical men, who lay

claims to be "specialists" in sexual disorders, but the routine treatment they receive usually tends to aggravate their trouble instead of relieving it.

Treatment: In adopting a line of treatment in sexual disorders, resulting from neurasthenic conditions, it should be borne in mind that both the voluntary and involuntary functional activity of the sexual organs are acted upon from without, through the medium of the nervous system, hence it is through this source that it is possible to reach the abnormal condition by proper medication. At the outset, the treatment should be aimed at the cause of the neurosis, whatever that may be. If the patient gives a history of syphilis, or becomes weakened from the depleting effect of diabetes, these morbid condition; should direct the form of treatment required to overcome the neurasthenic state following. The patient should be told that the weakness of the sexual organs is but a symptom of the constitutional ailment, and that sexual vigor will return as soon as the cause can be removed by proper hygienic and remedial treatment. In this way, his mind will be diverted from his sexual trouble and relieved from constant worry.

The treatment in the meantime should be directed to cure the causal condition and stimulate the feeble reproductive organs, and as an incentive to persist in the treatment the patient should be advised that the sexual vigor will be restored upon the removal of its cause, whenever this is possible.

Constitutional syphilis, causing the neurasthenia, will call for arsenic, iron, phosphorus, and the lime salts, together with rich nutritious food, salt baths and an outdoor life. Diabetes mellitus may be successfully medicated with Fowler's solution of arsenic, aromatic sulphuric acid, rhus aromatica, belladonna, dilute phosphoric acid, and the non-saccharated mixtures of the lime salts, in feeble states. All sweets and starchy foods are to be eschewed, the diet being composed principally of meats, stale bread, or bread made from pure gluten flour. Tubercular disease will require much the same treatment as was advised in syphilis, being guided in the prescribing of therapeutic agents by the symptomatic indications in each individual case. Mental and nervous disorders will have to be treated according to the prevailing indications. Such remedial agents as gelsemium, rhus,

passiflora, phosphorus, iron, arsenic, avena and strychnia are here suggested to meet prevailing conditions usually met with in the several phases of the disease.

The following prescriptions will serve well as active stimulants to the dormant nerves supplying the sexual organs:

R.
　　Strychnia nitrate ....gr. j.
　　Phosphoric acid (dil.) ....3 j.
　　Aqua pura, q. s. ....fl. 3 iv.
M. Sig.—A teaspoonful three or four times a day.

R.
　　Fowler's solution ....3 i.
　　Comp. syrup hypophosphites, q.s. ....fl. 3 iv.
M. Sig.—A teaspoonful in a half wine glassful of water one hour after meals.

R.
　　Spc. Tr. Avena sativa ....3 j.
　　Elixir glycero-phosphate of lime and soda, q.s.....fl. 3 iv.
M. Sig.—A teaspoonful every three hours during the day.

One of the most active medicinal excitants to the dormant nerves of the sexual organs is Vini Mariana, a French compound. It can be taken in from a tablespoonful to a half wine glassful before meals and on retiring. It should not be continued for a long period of time, owing to the likelihood of forming a liking for the tippling remedy. The potent agent can, with much benefit, be alternated with one of the above appended prescriptions.

SCURVY—SCORBUTUS

Scurvy is a constitutional disease, having for its chief characteristic, an impoverished state of the body, accompanied by such local symptoms as spongy gums, swollen and tender muscles and joints, with a tendency to hemorrhages into cellular tissue.

The principal etiological factor producing this morbid disease is the living for a long period of time on salted or corned meats and sparingly of vegetables and fruits. Fresh meat is not so apt to cause scurvy, although living upon it exclusively generally develops an unhealthy state of the system.

Sailors, soldiers, and persons engaged in mining in remote parts, where a varied diet is hard to obtain, are likely to fall victims to the ravages of the disease.

The degenerating disease is slow in developing, the early symptoms being that of progressive weakness, failing appetite. sore gums, bad digestion, constipation and pale features. At a later period, hemorrhage takes place from the swollen gums and mucous membranes in general; a marked anemic state super-venes and the patient goes rapidly into a decline.

Treatment: The chief cause of scurvy being the lack of a mixed diet, and the eating too freely of salted or canned meats, it is of the first importance to exclude the latter and adopt a diet of such vegetables, fruits and acids, as have been found by experi-ence to overcome the morbid phases of the disease. in adopting a line of treatment. The juices of oranges, lemons, limes, grape-fruit and pineapple, taken in moderate quantities, will speedily relieve many of the worst features of the disease.

In cases where the disease has not progressed to the degree that the teeth have become loosened, preventing mastication, fresh meats, baked beans, potatoes, tomato and lettuce salads made with cider vinegar, cabbage and greens, may be partaken of in moderation. In the worst forms of the disease, where the teeth are loosened or have fallen out, and digestion is impaired through frequent attacks of stomatitis, the diet, of necessity, will have to be composed of such liquid foods as will be best suited to the individual case; here, soups and broths made from fresh meats, and thickened with tender vegetables, will find a place, as will eggs and milk, fixed up in their various forms.

The hemorrhagic phases of the disease call for citrate of iron, citric and tartaric acid and such styptic agents as will meet the requirements in the case. Peptics and tonics are indicated in feeble states after the early phases of the disease have been re-lieved. The following mixtures have met these requirements in most instances.

R.
Liquid beef peptonoids ....ℨ ij.
Elixir glycero-phosphate of lime and soda ....fl. ℨ iv.
M. Sig.—A dessert spoonful in a small wine glassful of water before or after meals.

℞.
  Dilute phosphoric acid ....℥ iij.
  Tr. iron ....℥ j.
  Simple Elixir, q.s. ....fl. ℥ iv.
  M. Sig.—A teaspoonful every three hours in a little water.

℞.
  Fowler's solution ....℥ j.
  Syrup lacto-phosphate of lime, q.s. ....fl. ℥ iv.
  M. Sig.—Given instead of the peptonoid mixture, in cases
    showing a puffiness of the eyelids and edema of the feet
    and ankles.

Ulcers appearing on the spongy gums should be treated with washes of tincture of myrrh, chlorate of potash, dilute citric acid or the alkaline mixture. The latter antiseptic solution will serve as a potent wash for ulcers appearing on the feet, legs, or other portions of the system. The worst forms of ulceration of the extremities may call for amputation.

RAYNAUD'S DISEASE

Raynaud's disease, sometimes called symmetrical gangrene, is a localized circulatory disturbance, through which certain portions of the system, especially the ends of the fingers and toes, and even the nose and lobule of the ear, become anemic, gradually lapsing into a state of gangrene. The cause of the morbid state appears to be an impairment of the circulation in distal parts, probably due to a neuritis, causing vascular spasm of the capillaries.

Persons of feeble constitutions, especially women and children and others living in cold, damp climates, are prone to attacks of the devitalizing disease. An early symptom of the disease is a numbness in the part affected; if in the fingers, the fleshy part or pads of the digits is where the syncope is manifested; this condition soon becomes exaggerated and the parts become atrophied and more or less painful, often followed by gangrene.

Treatment: The morbid condition is to be managed according to the existing states of the disease. If the system is impoverished by disease or exposure, peptics and tonics, together with nourishing food and outdoor exercise will be demanded. The functions of the skin, kidneys and bowels, if abnormal,

should be righted and a change of climate advised in cases suffering from miasmatic conditions.

In grave cases, the patient should be kept at rest in bed, and massage and galvanism applied to local parts likely to suffer necrosis. The prime object in the application of local measures is to relieve tenderness and pain and restore a normal circulation in the asphyxiated parts.

As internal remedies, arsenic, phosphorus, strychnia and the lime salts will suggest themselves, taken in small but repeated doses.

Amputation of the limbs is often required in cases where the necrosis seem to be progressive, attacking the fingers and toes, gradually spreading to the hand and foot, with symptoms of systemic invasion of absorbed septic matter.

RADIUM IN SURGERY

That radium contains potent antiseptic properties has been conclusively proven in the recent past, in the treatment of ulcerative skin diseases and morbid growths, both benign and malignant in character. The therapeutic action of this new element is developed through the radioactivity upon the normal salt solution.

The exorbitant price that the subtle agent brings puts it beyond the reach of many, hence its extended use will be limited until carotite and pitch-blend, from which it is obtained, are discovered in larger quantities than can be had at present.

The action of this potent agent, like the Roentgen rays, is likely to excite irritation of the parts subjected to its penetrating influence, when administered by those unacquainted with its active forces.

A dermatitis will often result from an exposure of many hours duration, that will require several days to subdue. Its action upon mucous membrane is much more severe than on the skin surface, exciting a hyperemic condition with a few hours.

The force of this potent agent is usually gauged by active units and is spoken of as the **activity** of solutions or coatings, 25.000 units or activities being the ordinary force usually em-

ployed in the treatment of lupus, psoriasis, chronic eczema. ulcers and epitheliomas. The frequency of application required in these affections will depend in a great measure upon the severity of the morbid condition and the effect of the force of the radium displayed at the initial sitting; 25,000 active units have been displayed on a lupus for from forty-eight to seventy-two hours and the treatment repeated in ten days with a deadening effect upon the ulcer and with but little irritation to the adjacent parts.

Cancer and sarcoma cells have lost their nuclei when the growth was subjected to high radium activity for forty-eight hours, and the treatment repeated in two to five days, producing atrophy of the growths without any apparent injurious effect to surrounding parts.

Under the effect of radium gelatine solution repeatedly applied, warts and moles have been made to shrivel up and finally disappear, leaving no scar to mark their origin. The ravages of.epithelial cancer have been checked and put in a condition to heal after repeated application of radium, likewise eczematous and varicose ulcers, rectal fissures and ulcers, and mucous growths of long standing. Piles and rectal ulcers are usually treated with bougies or rectal dilators coated with radium gelatine in graded strengths.

The use of this powerful agent in the cure of morbid conditions is passing through the experimental stage, but the success that has followed its extended use gives it a wide range of application.

The application of radium rays to skin affections is, as a rule, absolutely painless; hence it is to be preferred to the X-ray. which often produces such severe burns that it takes a long time to recover; however, radium sometimes causes a slight dermatitis when its rays are applied to the skin, even through the medium of a glass tube of salt water charged with a bromide solution (the usual form prepared for use) and carried in the pocket for a few days.

POISONS, THEIR ANTIDOTES AND ANTAGONISTS

Any substance which when taken internally or applied externally to the body, causing disease or proving destructive to tissue is, in a medical and toxicological sense, a poison.

Poisons are classified as irritants and narcotics; the former destroying the tissues with which they come in contact, and the latter causing insensibility and death by their action upon the brain.

Treatment. The general treatment is to free the system from the noxious agents, which is accomplished by potent emetics, promptly administered by mouth or hypodermically, if the destructive substance is still in the stomach, followed by washing out the viscus with some bland solution where the poison has been actively irritant and then some remedial agent administered, the action of which is known to be antagonistic to the poison, counteract the effect of such portion of it as may have been absorbed, and lastly, such supporting measures should be employed as will whip up into activity the lagging vital forces. Poisoning from the alkaloids takes place rapidly and usually by the time professional aid is secured absorption has proceeded so far that "first aid antidotes," if given, are of little value; in such cases reliance must be placed upon the physiological antagonist and a supporting treatment.

Antidotes are agents that alter the effect of a poisonous drug either physically or chemically or both, thereby changing its character before absorption takes place, thus preventing a poisonous effect upon the body. They are usually administered internally in fluid form or by inhalation in both vegetable and mineral poisoning, but have little effect against the lethal effect of poisons administered hypodermically. Agents of the class referred to above are emetics, cathartics, washes and injections. The use of ligatures and the stomach-pump, also the tourniquet, are often resorted to and are known as mechanical antidotes. The common or true antidotes are starch, milk, oils, albumen, soap, charcoal, alkalies, acids, tannin, permanganate of potash, sodium chloride, iodine, and iron.

Antagonists are agents, the physiological action of which oppose each other, that is, the action in the organism of one agent neutralizes the effect of another that has been previously taken. They are first absorbed; entering at once into the circulation they permeate the entire tissue structures of the body. Unlike the action of antidotes, antagonists neutralize poisons hypodermically administered. The alkaloids or active principles of plants are classed as antagonists. Of the most energetic of the alkaloids may be mentioned atropia, caffeine, brucine, emetine, morphine, apomorphine, strychnia, physostigmine, and veratrine. The chemicals, chloral and oxygen, have a similar action and are frequently employed as antagonists. Such measures as artificial respiration, constant motion, the application of electricity to the respiratory muscles antagonizes the effect of some poisons in a marked degree.

When poisons are swallowed in fluid form, the stomach-pump is efficient to rid the viscus of the lethal substances, and is not as weakening as are emetics; however, the implement is not always at hand when an emergency requires its use. Its use is contraindicated in cases where the mucous membrane of the stomach and esophagus has been destroyed by corrosive fluids, as there is danger of perforation.

MINERAL ACIDS—Antidotes are magnesia, white of egg, chalk, flour, carbonate of soda in solution, water freely, later emollient drinks, sweet oil, cod-liver oil.

Antagonists—Opium, strong liquor of ammonia, ten to fifteen drops to a drachm of distilled water, used intravenously. Alcohol for its stimulating effect.

CARBOLIC ACID—Epsom salts in liberal doses, alcohol if given as soon as the acid is taken, soap suds, strong cider vinegar; later give slippery-elm water to be drunk freely.

Antagonists—Atrophine in small and repeated doses to stimulate the heart until elimination occurs, can be given hypodermically; amyl nitrate, later alcohol in small doses for its stimulating effect. Heat to the extremities in ened collapse.

HYDROCYANIC ACID—This lethal agent acts quickly, giving little time to obtain antidotal remedies. Ten to fifteen drops of ammonia given intravenously will support the vital forces. The inhalation of ammonia will whip up a lagging heart action. It is claimed that cobaltous nitrate is a true antidote. Twenty to thirty grains of chloride of sodium in water by mouth or given per rectum will support the waning strength. When first taken use stomach-pump.

Antagonists—Stimulating agents as whiskey, brandy, ammonia, and amyl nitrate, artificial respiration, electricity to muscles of the chest, cold water to the spine.

ACONITE—If seen early give emetics; apomorphia given hypodermically, use stomach-pump; tannic acid in liberal doses neutralizes the lethal agent; charcoal given in water; stimulate and apply heat to feet and legs.

Antagonists—Coffee, amyl nitrate, ether, ammonia, morphine, digatalis, caffeine administered hypodermically.

ATROPIN, BELLADONNA—Tannin, sulphate of zinc, or apomorphia given hypodermically to provoke emesis, also mustard in warm water for the same purpose; physostigma in $\frac{1}{8}$ grain doses, pilocarpine in $\frac{1}{8}$ grain doses.

Antagonists—Morphine, brandy, strong coffee or caffeine, capsicum, ammonia by inhalation. Apply cold to the head and slap the body with cold wet towels.

ARSENIC—Hydrated sesquioxide of iron freshly made, or in its stead give 30 grain doses of dialized iron; bicarbonate of magnesia, charcoal in 20 to 30 grain doses, apomorphine given hypodermically; later treat conditions as they arise. Olive oil, lime water, milk and calcined magnesia for irritation of the stomach.

ANTIMONY, TARTRATE OF—Tannic acid is a true antidote, as are some substances containing it. Egg albumin and milk serves a good purpose to allay irritation of mucous surfaces. Magnesium and sodium also possess antidotal properties.

Antagonists—Active antispasmodics, of which ether and amyl nitrate are the most prompt, opium, and alcohol for its stimulating effect.

OPIUM, MORPHINE—Permanganate of potassium in solution in double the quantity of the amount of morphine swallowed, subsequent doses less in quantity. Atropin given in small doses administered hypodermically. Use stomach-pump if drug is still in the stomach. Apomorphine in one-tenth grain doses given hypodermically immediately following the taking of the drug, a prompt emetic; tannic acid, powdered charcoal.

Antagonists—Atropin, small doses repeated every twenty minutes for three doses, favorably impresses the heart action as well as that of respiration; caffeine or strong coffee, amyl nitrate, ammonia by inhalation, cocain, strychnia, stimulants, artificial respiration. The bromides to relieve nervous irritation, keep the patient moving about, cold douches to the spine. Later give stimulating and nourishing foods.

OXALIC ACID—Lime water freely, plaster off the walls if no other preparation can be obtained, calcined magnesia.

Antagonists—Opium, ammonia, small and frequent doses of whiskey or alcohol as a stimulant.

PHOSPHORUS—Sulphate of copper in solution as an emetic, apomorphia one-tenth grain dose given hypodermically, cathartics but no oils. Potassium permanganate is a very reliable antidote.

Antagonists—Opium in small doses to overcome cardiac depression; transfusion.

ALKALIES—Lemon juice, vinegar, dilute acetic acid, later give milk, gelatine, albumen, olive and castor oils.

Antagonists—Alcohol, caffeine, strong soffee to stimulate.

NITRATE OF SILVER—Common salt given freely in solution; if this does not provoke emesis, give one-tenth grain apomorphia hypodermically; move the bowels with castor oil; bicarbonate of magnesia in solution.

Antagonists—Milk freely; opium if irritation of mucous membrane of the stomach is marked.

STRYCHNIA, NUX VOMICA—Tannic acid is a true antidote, forming an insoluble tannate, nitrate of amyl, bromide of potash and chloral hydrate, 20 to 30 grains of the former to 40

to 60 grains of the latter at a dose; potassium permanganate in 6 to 10 grain doses largely diluted; chloride of sodium.

Antagonists—Keeping the patient quiet is of great importance: chloral, chloroform or ether by inhalation, amyl nitrate, veratrum viride in liberal doses.

TOBACCO—Emetics if taken into the stomach, mustard and warm water, apomorphia, cider vinegar in frequent small doses, and later small doses of strychnia.

ZINC SALTS—Produce emesis if patient is seen early after taking the lethal agent; carbonate of soda in solution used freely, albumin, milk, tannic acid, lime water, strong tea, soap-suds.

Antagonists—Opium, morphine.

POISONOUS FISH—Produce emesis, apomorphia one-tenth grain hypodermically, powdered charcoal, give purgatives to clear the bowels and later stimulants.

MUSHROOMS—Emetics at first, castor oil if some time has elapsed, tannic acid, charcoal.

Antagonists—Give alcoholic stimulants; atropin, in small doses 1-100 to 1-120 grain administered hypodermically.

CANTHARIDES—Give emetics if the drug is still in the stomach, opium, demulcent drinks as barley water, slippery-elm water, gruel, water drunk freely.

Antagonist—Opium.

CHLOROFORM—Give plenty of fresh air, and resort to artificial respiration, see that the patient's tongue does not drop back into the pharynx: atropin, strychnia, amyl nitrate by inhalation: also oxygen, sodium carbonate in solution; emetics, strong coffee.

Antagonists—Strychnia and atropin in small doses given hypodermically: slapping the body with a wet towel.

COLCHICUM—If seen early give emetics; later apply artificial heat: give brandy, ammonia, and coffee in cases of collapse; opium.

.CONIUM—At first clear the stomach with hypodermic injections of apomorphia; later apply heat and give stimulants freely.

COPPER SALTS—Give magnesia freely, milk, albumin, paste of flour and water. Use stomach-pump to clear the stomach of fluids; soap-suds freely.

Antagonists—Opium, demulcent drinks to relieve irritation of the stomach.

MERCURY—Albumen, milk, gluten, flour. Use stomach-pump in favorable cases; charcoal, potassium iodide, bicarbonate of magnesium.

Antagonists—Bismuth, sodium sulphate, tannin, belladonna.

CROTON OIL—Clear the stomach with emetics, give mucilaginous drinks, opium in small and repeated doses to control frequent bowel movements.

CHLORAL HYDRATE—Liquor potassium in drachm doses largely diluted with water; emetics. Use the stomach-pump in recent cases.

Antagonists—Heat, small doses of strychnia, atropin in small doses, amyl nitrate, strong coffee, friction and artificial respiration.

DIGITALIS—Emetics if the case is seen soon after swallowing the drug. Tr. aconite in medium doses, opium, rest in the recumbent position, tannic acid in solution followed by emetics.

CYANIDE OF POTASSIUM—Give freely of ferrous sulphate, followed by emesis to clear the stomach, cobaltous nitrate is a true antidote.

Antagonists—Alcohol, strychnia, digitalis, ammonia, artificial respiration, friction.

ELATERIUM—Slippery-elm or barley water drunk freely; tr. opium 10 to 15 drops in six ounces of starch water injected into the rectum; apply external heat.

HYOSCYAMUS—Use stomach-pump early; emetics, physo-stigma in one-tenth grain doses, pilocarpin in one-eighth grain doses; later give stimulants internally and apply them externally.

ILLUMINATING GAS—Nitroglycerine in drop doses administered hypodermically every 30 minutes or as may be needed.

Antagonists—In pronounced cases of coma resort to artificial respiration.

IODINE—Clear the stomach with emetics; give starch in solution freely; opium, heat in cases of collapse.

LEAD SALTS—Sulphate of soda or magnesia in solution freely; follow with emetics to clear the stomach; opium, milk.

LOBELIA—Use stomach-pump to clear the stomach. Rest in the recumbent position, stimulants taken internally and applied externally

FUNGI, POISONOUS—Emetics, charcoal.

Antagonists—Atropin is a true specific in many cases of fungi poisoning given in small doses hypodermically.

COCAINE—Tannin, potassium permanganate, iodine, charcoal, albumin.

Antagonists—Chloral hydrate, ether, chloroform, morphine, amyl nitrate, alcohol for its stimulating effect. Artificial respiration may be resorted to in severe cases.

CANNABIS INDICA—Emetics, stomach-pump, to clear the stomach.

Antagonists—Lemon juice, alcohol, strychnine.

COAL TAR PRODUCTS—Belladonna or atropine in small doses to maintain the blood pressure; strychnia, oxygen by inhalation to overcome cyanosis. Heat applied externally; stimulants.

ALCOHOL—Emetics or stomach-pump to clear the stomach of the irritating fluid.

Antagonists—Aromatic spirits of ammonia in 20 to 40 drop doses in a little sweetened water; ammonium chloride, 3 ss in a

glass of water drunk at one time; chloral given with some caution to produce sleep following a debauch; 20 to 30 grains every four or five hours will give the desired results.

IPECACUANHA—Vegetable acids act as antidotes to ipecac.

Antagonists—Bismuth, carbolic acid.

IRON—Carbonate of sodium and ammonium, magnesia. and later demulcent drinks.

PILOCARPINE, JABORANDI—Persulphate of iron.

Antagonists—Atropine in small doses is a true specific: morphine for the control of nausea and vomiting.

ROUGH ON RATS—As these compound pastes contain certain amounts of phosphorus and arsenic the antidotes for those poisons will be available here.

RHUS, POISON OAK, **Antagonists**—External application. 5 per cent cocaine solutions are efficient in allaying the spasmodic itching. Solution of grindelia robusta 1 part to 10 of water is also an efficient agent. A teaspoonful of concentrated lye to the pint of water is effective. Carbolic acid in 5 per cent solutions is very serviceable here. Solutions of lobelia, corrosive sublimate, and acetate of lead are also serviceable: carbolic acid 5 ss. oxide of zinc 5 iij, lime water Oj, makes an available wash for excoriated parts. Keep the bowels moving with the salines: enjoin rest in bed on a mild diet.

SERPENT-VENOM—Permanganate of potash in a 2 per cent solution, a drachm or more injected in and around the wound with a hypodermic needle gives as near a specific as is known for this class of poisons, especially if it is used at once after the reception of the sting. It will be well to ligate above the wound to retard the spreading of the poison to distant points. Solutions of chloride of lime 1 part to 60 of distilled water makes a reliable antidote in most cases. 20 to 30 minims is the required dose used hypodermically in and around the wound. Solutions of chloride of gold, and chloride of lime are also available here; liquor ammonia, 10 to 12 drops, diluted in a small teaspoonful

of water, gives a true specific if injected into a vein. Echinacea externally and internally.

Antagonists—Strychnia hypodermically; alcohol or brandy freely: arsenic to overcome great prostration; enjoin rest and give stimulating and nourishing fluid diet.

NITROUS OXIDE

Nitrous oxide, or laughing gas, is frequently administered to perform operations requiring only a moment or two of time. It is quite pleasant to take and is often administered previously to giving chloroform or ether. It is considered the safest of all the general anæsthetics, yet it should not be given to individuals suffering from atheromatous arteries or those advanced in life.

The gas should be administered from a rubber bag fashioned for the purpose, and the procedure should be in the hands of one accustomed to giving it, not to excite the patient's fears; all preparations for the administration of the lethal agent should be done out of the patient's sight. The bag holding the gas is usually placed in the lap of the patient or on a chair near at hand. The mask through which the gas is inhaled is made to fit tightly over the patient's face, that no air is inhaled with it.

When everything is in readiness, the patient is instructed to breathe deeply, and if there are no conflicting circumstances to prevent it, insensibility will be produced within two minutes. The anæsthetic agent at first rather excites or stimulates the patient; quickly following this stage the eyes become staring and rather fixed, the respirations labored and stertorous; the face, flushed at first, soon becomes cyanosed and the pupils slightly dilated. With this state of the patient present, anæsthesia is quickly produced, which will last, under ordinary circumstances, for one or two minutes. If a prolonged anæsthetic state is desired, the gas should be administered in combination with oxygen.

Nitrous oxide is purchased on the market in liquid form stored in metal cylinders, under high pressure. The gas is transferred from these metal retainers to the administering bag when needed.

It is always advisable to have an able assistant at hand to administer the gas and to help guard the patient against any possible injury while he is under the influence of the benumbing agent. There are no unpleasant after-effects following the taking of the gas.

MYCETOMA—MADURA FOOT

Mycetoma and madura foot are synonymous terms, signifying a degenerative affection of the skin and fleshy parts of the toes and fingers. Commonly, the disease is characterized by a nodular swelling of the parts involved during the early stages. but sooner or later ulceration sets in, attended by a fetid purulent discharge, very acrid in character, rapidly destroying the soft parts, often necessitating amputation.

The disease prevails in hot, sultry climates, among the natives who live in squalor and are deprived of such food as would tend to nourish the body.

The disease is not transferred to animals, but is to individuals by inoculation and contact, it being a morbid condition due to germ infection.

The manifest symptoms are those of local nodular swelling, with tenderness and stiffness of the affected parts; later ulceration with a discharge of purulent matter.

Treatment. The treatment is that of chronic suppurative processes. If the general state of health is below the normal standard, peptics, stimulants and tonics are indicated with plenty of rich, nourishing food. During the early phases of the affection. the nodular tissue may be removed by incision or excision, and the ulcers that appear at a later period will require the application of chloride of zinc, or pure phenic acid. followed by potent antiseptic dressing, of which kreso in a two per cent solution proves especially effective. Lysol, and salicylic acid and borax dissolved in glycerine are also active antiseptic and curative agents.

ACROMEGALY

Acromegaly is a disease of the osseous tissue, characterized by a gradual enlargement of the bones affected. The bony structures of the face, hands, and feet are common sites of the morbid condition, but not infrequently the osseous structures of the body and limbs undergo the same morbid changes. The soft structures surrounding the bones, having undergone this abnormal growth, often suffer marked changes in texture, becoming thick, spongy, and quite vascular in some instances.

The disease generally manifests itself during middle and adult life and in individuals suffering from some form of constitutional taint producing morbid changes in the fluids of the system. These changes are thought, by some pathologists, to be due to a morbid state of the pituitary body, a small glandular organ located in the pituitary fossa in the sphenoid bone.

The edges of bone plates and the cartilaginous ends of other osseous structures are generally the primary points of the affection.

The physical symptoms of the disease are gradual enlargement of the parts affected and the deformity naturally following. In advanced cases the voice becomes markedly changed, the individual speaking in a deep, coarse tone. Occasionally a case occurs where headache is a feature, as well as defective vision, pain is seldom experienced unless some nerve branch becomes involved in the bony enlargement. The patient often shows a condition of mental hebetude. While the disease is of a degenerative nature, it is slow of growth and seldom, if ever, causes a fatal termination.

Treatment: The medicinal treatment of this morbid condition is not entirely satisfactory. Special features of the ailment, as pain, headache and lassitude, may be relieved with the indicated remedy. Specific bryonia, macrotys, iris and phytolacca usually find a place in the early phases of the disease and Donovan's solution of arsenic, iodide of strontium in five grain doses, and some of the other iodine preparations will retard the osseous development in most cases. A flagging appetite

will be stimulated with acid solution of iron, dilute phosphoric acid, nux and the bitter tonics.

In grave cases of the disease the pituitary gland may be exposed and morbid processes removed; seldom if ever, do other deformities become so burdensome as to require a resort to surgical measures for relief.

BONE TUMORS

There are several varieties of tumors that have their origin in bones and in the tough, fibrous membrane covering these structures. The most common of these growths are chondromata, cysts, and malignant tumors; and endothelioma is occasionally met with in a general surgical practice. The treatment of chondromata is given in another part of this volume, hence, will be omitted here.

Bone cysts usually arise from injuries, but may result from infection of the periosteum. In pronounced cases the growth may cause a degeneration of the adjacent osseous structure, seriously crippling a finger or toe, a common location of the morbid condition.

During the progress of development, the patient complains of soreness, more or less pain, and a partial disuse of the digit upon which the growth appears. On pressure, the little tumor feels hard and if it appears upon the distal joint of the thumb or great toe, the morbid state is often mistaken for an inflamed condition of the sesamoid bones. The contents of these cysts is either a straw or coffee color and of the consistency of egg albumen. These growths resemble somewhat solid tumors of the bone, but a punctured incision will determine the difference.

The treatment consists in opening the cyst, cleaning out its contents and cauterizing the cavity with pure carbolic acid, after which wet antiseptic dressings should be applied and then bandaged.

Carcinomata either commences in the periosteum or originates in the medullary canal; in either case the bony substance soon becomes involved and destruction gradually follows.

The long bones are generally the seat of the malignant disease and it commonly appears as a result of injury. These growths constitute both varieties of the malignant disease, viz.: the round and giant-celled; the former usually attacks the periosteum and the latter is more often found in the medullary growth, which usually commences in or near the extremities of the shaft of the long bones. The round celled variety of tumor is extremely malignant and often causes rapid destruction of tissue. The giant-called sarcoma develops slower and is less destructive in character. In advanced cases the osseous structure becomes soft and spongy and transformed into a mass of cellular tissue.

Carcinoma of bones occurs as a secondary affection, the disease first appearing as a primary disease in some other part of the body. Its devitalizing action and its progress will largely depend upon the portion of bone attacked and the physical condition of the patient to resist disease. In some of its characteristics it resembles the morbid action of a sarcoma and it is claimed by pathologists that the cells of both varieties of malignant growths may be found in a well marked case.

The skin over a developing malignant growth often assumes a dark color, caused by a change in the pigmentary layer of the integument, and the growth either presents a firm, round or oval swelling or a soft cyst-like tumor, the contents of which is a light coffee colored fluid of the consistency of thin gelatin. Besides the swelling of the parts involved, there is often rigidity of muscles, and pain of greater or less intensity is a feature.

Amputation is the only treatment that can give any promise of a cure in malignant disease of the osseous tissue, when the morbid condition is situated where such a procedure would be justified, that is to say, the amputation should be done a sufficient distance above the seat of the disease to insure the removal of all the tissue that is likely to be involved in the morbid affection. After the removal of the diseased portion, the patient may rapidly gain in health and get well, yet the morbid affection may reappear again in tissues higher up and rapidly terminate the patient's life.

During the time of treatment the patient should be given remedies to tone up the system, functional organs kept stimulated to action, and nourishing food partaken of at regular intervals. When possible, the patient should remain much of the time out-of-doors and salt baths or rubs should be indulged in several times a week.

Coley of New York, after repeated experiments in the treatment of inoperable and secondary sarcoma, with a mixture of the toxines of streptococcus erysipelatis and bacillus prodigiosus reduced to a fluid, has greatly benefited many cases and established a cure in others that were, owing to the nature of the cases, considered hopeless. Further experiments with the agent will be reported from time to time and it is hoped that the potent fluid will maintain its estimated reputation in the treatment of malignant disease, especially sarcomata.

Not much confidence should be placed in any form of treatment of carcinoma of bones, as the disease is a secondary deposit to the affection primarily established in other parts of the body, the devitalizing effect of which will prove rapidly fatal.

CHIMNEY-SWEEP'S CANCER

Chimney-sweep's cancer is of the epitheliomatous type and appears on the scrotum, first as a warty excrescence, known as a "soot-wart," which sooner or later takes on a degenerative state that spreads and soon involves the surrounding tissue in ulceration and infection of the nearby lymph glands. The seriousness of these growths seldom excites the suspicion of the patient, owing to their simple appearance at first; not until the breaking down of the lymph glands in the groin in ulceration and the disinclination of the primary lesion to yield to treatment, is the true nature of the growth determined.

The extension of the ulceration around the primary point of attack is often held in check for a time when the nearby lymph nodes break down in extensive necrotic disease, concentrating the local infection to the area that is most actively inflamed by the malignant disease.

The symptoms accompanying "soot-cancer" are sharp twinges of pain in the part, sometimes characterized as burning by the patient, at the onset, which later gives way to deep-seated pain, swelling and edema of the scrotum, and not unfrequently of the penis. After ulceration sets in, there is a constant discharge of serum, sometimes discolored with blood and purulent matter.

There is generally a degree or more of fever in advanced cases, often alternated with slight rigors, followed with headache and disturbance of bodily functions.

Treatment: The treatment consists of the early removal of the growth, before it assumes , a pronounced malignant character; if this is done it seldom reappears, but if the operation is delayed it is very apt to recur at the same point or some one of the lymph nodes in the groin will break down in ulceration, which may soon spread to adjacent glandular structures. Seen at this period of the disease, the scrotum, together with the testicles and the entire chain of lymph nodes in the groin had better be removed in their entirety. The general health of the patient should be looked after by advising good, nourishing food, outdoor exercise, and such stimulating and tonic remedies as the nature of the case requires.

In such cases as refuse operative measures, the ulcerations should be attacked with butter of antimony, chloride of zinc, or other potent agents, useful in such cases. This form of treatment may delay the progress of the malignant disease, but too much dependence should not be placed in it to eradicate the ailment.

ARTIFICIAL LIMBS, EYES, AND RESPIRATION

There is but little said in most textbooks upon these subjects, requiring the surgeon to seek such information as he needs from shop-keepers or instrument makers when a case falls into his hands, calling for an artificial limb. To fulfill all requirements, an artificial limb should be light, durable, simple of construction, free from squeak and rattle, and worn without discomfort.

Stumps left after amputations at the joints are end-bearing with but few exceptions; in all others the pressure of the artificial limb is directed against the side of the stump. The former is the most convenient for the patient, if the amputation has been properly executed. The socket for thigh stumps are usually made of some light tough wood and covered with rawhide, while the remainder of the artificial limb is hollowed out to reduce weight (see Fig. 405). The feet of artificial legs are usually made of rubber, with a spring mattress and air cavity at the heel to relieve concussion and render walking noiseless. An artificial leg and foot constructed as described with a simple, yet durable mechanism at the knee joint, makes the most perfect artificial limb that it is possible to obtain. The author
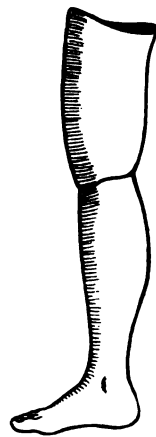
Fig. 405.—Artificial leg made of light wood, and covered with rawhide, to be worn on a thigh stump. The foot is made of rubber.

Fig. 406.—The illustration shows an artificial limb suitable to be worn on a knee-bearing stump.

has had occasion to examine artificial legs and feet made after the above mentioned pattern by A. A. Marks of New York, and found them perfect in fit and construction. Fig. 406 shows a suitably constructed limb for a knee-bearing stump, whether the leg was amputated at the knee joint or a short distance below, the stump being fixed at right angles. Fig. 407 shows a sectional view of the artificial limb with its spring mechanism, which

aids materially in extending the leg on the thigh. The bearing can be so adjusted that walking is made comparatively easy. The socket is usually made to lace in front, a convenience of great importance in end-bearing and flabby stumps.

Artificial limbs are of quite different construction when made to adjust to the stump in leg amputation, to what is required for a thigh stump, the mechanism of the knee not being required. In amputation of the feet, a short stump gives better

Fig. 407.—This illustration shows a useful artificial limb, to be worn on a tibio-tarsal stump.

satisfaction and more comfort to the patient when fitted with an artificial foot, than does a long stump. The above cuts show quite well the wooden leg to which the rubber foot is adjusted so perfectly, without the complicated ankle joints of ordinary limbs, that no creak or rattle is observed in walking about. The rubber foot made by A. A. Marks is so perfect, and the patient walks about with so little awkwardness, that observers are often deceived as to the real condition. It is said by makers of artificial limbs that a Syme's or Pirogoff stump is the best fashioned to which an artificial foot may be

adjusted. Fig. 407 represents a style of artificial limb with the proper form of socket for this form of stump. The same style of limb with the lower part of the socket modified to fit the individual case is recommended in amputations at the ankle joint. The patient really gets about with less discomfort than in partial foot amputations.

An artificial limb can be adjusted to a non-developed leg so that the patient can get about with but little discomfort. Figs. 408 and 409 well represent a case of this kind and the form of artificial limb made to fit it. It would be far better, of course. to amputate as much of the distorted foot and leg as would best
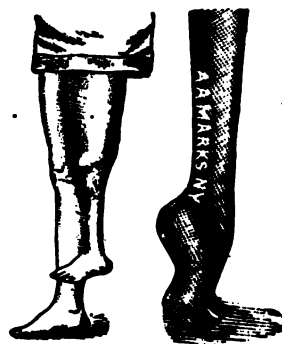
Fig. 408.—Congenital and short-ened limbs, following excisions of the knee and ankle joints.

Fig. 409.—Artificial feet and sock-ets, to be worn on congenital short limbs, or those deformed by excis-ion following joint disease.

accommodate a well fitting artificial limb, but unfortunately it it not always possible to get the consent of the patient or friends to such a procedure.

In shortened limbs following excisions or other traumatic injuries, the shoe can, in many instances, be extended downward sufficiently to make up for the shortening, thus leaving the foot at right angles with the leg, as is represented in Fig. 409.

A limb abnormally flexed at the knee-joint, where operat-ive procedures are denied, can be made serviceable by adjust-ing an artificial limb with a rubber foot, fashioned as repre-sented in Fig. 413. With women this form of limb is especially favored, as the deformity is hidden beneath the skirts.

Fig. 415 represents an artificial frame that can be worn in cases of ununited fracture of the tibia, where operation is

Fig. 410.—Cork and wood extension for short legs.

denied. If the mechanical structure is properly made and
justed, the patient will be enabled to get about without
aid of crutches.

Fig. 411.—Steel extension for short legs.

Fig. 412.—Deformity of the leg with fixed flexion at the knee-joint.

Fig. 413.—Artificial limb and rubber foot, to be worn as a substitute for crutches in deformity of the leg shown in the preceding illustration.

To compel a child to go around on crutches after losing a limb is little short of crime; in most cases they develop curvature of the spine, or the shoulders are forcibly elevated, causing the neck and head to appear as if sunk into the body. In time, such deformities become permanent and beyond the hope of any form of treatment to cure.

Unless ample provision is made for a suitable flap in amputation of the leg below the knee, in children, a conical stump is frequently developed; to lessen the chances of such a condition occurring, a properly adjusted artificial limb should be

Fig. 414.—The cut shows a case of ununited fracture of the tibia.

Fig. 415.—An apparatus, in the form of a long splint, that is adjusted to an ununited fractured leg, that enables the patient to get about without crutches or cane.

worn as soon as the stump has healed and the tenderness subsides. As the child grows, the artificial limb will have to be changed about every eighteen to twenty months. Its length will have to be increased, also the socket, and the foot expanded.

The use of crutches works a hardship at any stage in life, especially in old age. If the patient has led an active life, and later suffers the loss of a portion of one or both legs, compelling him to go about on crutches, his years will surely be shortened by the unfortunate change he is subjected to.

Artificial Eyes

Artificial eyes are made of glass, shell-like in shape, and in color and size made to conform to the natural eye. It is retained in place by the eye-lids, which close partly over it. The shell is not always easily kept in place, especially in cases where cicatrization reduces the sulcus or furrow, following the healing after the enucleation of the eye-ball. If the conditions are favorable for the wearing of the artificial shell, it will move in unison with the well eye, but seldom over as great an area.

The artificial eye may be worn in five or six weeks following the operation, or at least as soon as the inflammation and tenderness of the socket have subsided. The orbit is usually quite tolerant of the artificial shell; but it should not be worn, at first, more than an hour or two at a time, lest it excite pressure irritation. It should always be removed at night and placed in a glass of weak borax water and replaced in the morning.

To adjust an artificial eye the upper lid is raised with the fingers while the upper edge of the shell is slid beneath it. The lid is then allowed to drop over the edge of the shell. The lower lid is then depressed and while the shell is steadied with the finger, its lower edge is slid into the furrow behind it. To remove the shell, the lower lid is well depressed while the dependent portion of the artificial eye is made to glide over it, care always being taken not to drop the eye, or otherwise roughen its surface by bringing it in contact with some rough obstacle while handling it. In time most artificial eyes lose their

luster and their surface becomes rough; when such a condition arises the shell should be replaced with a new one.

Artificial Respiration

Artificial respiration is purely a mechanical act to excite chest movements, similar to natural breathing and is resorted to for relief in cases of asphyxia or suspended animation, from drowning, inhalation of poisonous gases, threatened dissolution from the inhalation of chloroform and ether, spasm of the larynx, morbid growths and the presence of foreign bodies in the trachea.

The air passages should be kept free from obstruction and as a necessary precaution and aid in establishing and maintaining natural respiratory movements, any and all clothing that constricts the chest, neck and abdomen, should be removed before commencing the manipulative procedure. The tongue must be pulled forward and not allowed to occlude the pharynx and the head should be kept lower than the body to prevent fluids from entering the larynx. The nose should be kept clear and the mouth open and all manipulative forces quickly executed while the patient is lying on the ground or low table. About fifteen forced respiratory efforts should be made per minute, the chest walls being compressed steadily but not too violently.

There are several methods utilized for exciting the respiratory movements, each having some good feature to commend it under certain conditions necessitating a resort to the procedure.

Sylvester's method is safe and effective in restoring respiration in most cases; not so much to be relied upon in cases of asphyxia from drowning perhaps, as Howard's method which will later be described. In the former method the surgeon grasps the arms of the patient above the elbows and forcibly draws them upward till they reach a point above the patient's head, while he lies prone on his back on the ground, bed or table, then force the arms downward against the sides of the chest, pressing it firmly; in four or five seconds repeat the procedure which should be at the rate of fifteen to twenty times per minute, and should be persevered in, if need be, for two or

three hours and even longer if any signs of life are in evidence. An assistant may render valuable aid by compressing the lower part of the chest with his hands at the same time the surgeon compresses the sides of the chest with the patient's arms. As soon as natural respiration has been established the patient's flagging strength should be whipped up with enemas of warm coffee, brandy and water, or other potent stimulating fluid. The patient should be placed in bed between warm sheets and kept at rest until the normal state has, in a great measure, been restored.

Howard advises that the patient be placed face downward with a pillow or cushion under the stomach with the head resting on the forearm. . The surgeon then places his open left hand on the lower and back part of the left side of the chest while the right open hand is laid upon the spinal column a little above the line of the diaphragm and firm pressure is then made with both hands for three seconds and ended with a vigorous push. These manipulations are to be kept up in case of asphyxia from drowning as long as fluids continue to flow from the mouth. The patient is now turned upon his back and a pillow or roll placed under his shoulders. The hands are next placed above the head and secured with a strong cord. The surgeon then kneels astride the patient's hips and presses the lower borders of the chest with the open hand, slowly but firmly upward and inward, lending force to the movement by throwing the body forward upon the arms, giving the chest walls a sharp push at the end of the procedure; at the end of two or three seconds the same movement is repeated and should be persevered in as long as there is any hope of again establishing natural respiration.

The Marshall Hall method and the mouth-to-mouth insufflation are sometimes resorted to, to excite respiratory movements of the chest under certain conditions, but neither method can claim any special features over the Sylvester or Howard methods if they are properly executed.

BUNION

A bunion is an inflammatory swelling of the mucosa of the bursa of the ball of the great toe, and it is generally found to exist in connection with that common deformity known as **hallex valgus.** The morbid condition is observed in different degrees of development and when the growth is much inflamed, it is extremely tender and painful to the touch.

Bunions are generally due to pressure, and the wearing of narrow toed boots and shoes is a common cause of the trouble. Cases are often seen where the great toe over-rides the one next to it, it then occupying a position nearly at right angles with the axis of the foot. An individual having such a deformity, walks with a limping gait and suffers pain keenly at every sudden change of the weather. In cases where the deformity is extreme, the toe rests in a partially dislocated state with a considerable amount of inflammatory deposit in and about the joint and bursal cavity.

In the early stages of the morbid condition, much relief from tenderness and pain during the inflammatory period may be realized by the topical application of libradol, lead and opium wash, equal parts of tincture of veratrum and witch-hazel, and a mixture of:

℞.
Menthol Crystals xL
Spts. Camphor, q. s. ....fl. ℥ vj
M. Sig.—Apply to part affected every two or three hours with
a camel's hair pencil or with a pledget of lint.

If after a reasonable time under this form of treatment, comfortable relief is not obtained, the bursal sac should be opened, its contents evacuated and the internal surface swept over with a pledget of lint or cotton dipped in pure carbolic acid or iodine. In case the sac is thickened to a marked degree, an incision is made over the top of the joint from before backward, dissecting down a flap exposing the bursal sac which is first opened and then dissected out. If there is found a sinus or communication between the bursa and the joint, the end of the metatarsal bone had better be cut away with cutting bone forceps or the chain saw, after which the toe should be straightened and the soft tissues closed over the articulation with cat-

gut. The wound should then be dressed antiseptically and the toe and foot immobilized with a splint or plaster dressing and the patient placed at rest in bed. With no complications, the wound should be healed in a week or ten days.

FOREIGN BODIES IN THE BLADDER

Foreign bodies are not infrequently forced into the bladder through the urethra by simple-minded individuals and others of a meddling turn of mind. Such objects as peas, pebbles, hair-pins, portions of slate pencils and other like foreign bodies have quite often been removed by surgeons, females being the sufferers more often than males. Sections of catheters have been frequently removed from the bladder of males, the instrument, becoming fragile from age, breaking while being introduced or withdrawn from the urinary viscus.

The principal effect resulting from the presence of foreign bodies in the bladder is an active irritation, often resulting in acute cystitis, more or less severe in character.

The symptoms indicating the presence of these foreign objects in the urinary viscus are burning pain in the region of the bladder, tenesmus and frequent urination, the urine not unfrequently being colored with blood.

The treatment adopted for relief from the morbid condition will be the same as for the removal of vesical calculi. In the majority of cases it will be necessary to open the bladder above the pubic bone or through the perineum and grasp the foreign body with the forceps and drag it forth. Following its removal the external wound should be closed as when doing a lithotomy operation, the after treatment being the same.

CONGENITAL HYDROCELE

Congenital hydrocele is frequently met with in surgical practice. In this form of the morbid condition the tunica vaginalis remains open, the membranous canal communicating with

the abdominlal cavity. The hydrocele is more frequently met with on the right side than on the left and produces a marked tumefaction in the inguinal region in well developed cases. The morbid state is incident to very early life, but is observed in individuals of middle age. It may occur in connection with the inguinal form of hernia, which greatly obscures the existing state of the parts involved.

The one characteristic feature of congenital hydrocele is the readiness of the protruding tumor to disappear, the fluid returning within the abdominal cavity as soon as the patient assumes the recumbent position, especially when the hips are elevated and the quick return of the serous fluid within the sac when the patient coughs or strains.

Treatment: Congenital hydrocele may be cured by the wearing of a properly fitted truss, but the instrument is cumbersome and is worn with discomfort by small children, but if this method fails to obliterate the serous canal within a period of a few months, operative measures had better be resorted to: the canal should be opened up, the neck of the protruding sac dissected free, litigated high up and the overlying soft parts readjusted and sutured as when doing an operation for the cure of a true inguinal hernia.

The operation is done under a general anæsthetic in small children, and local anæsthesia in individuals of more mature years.

ABSCESS OF THE LUNGS

Purulent collections are often found in the lungs and are the result of several cases, among which may be mentioned pneumonia, pyæmia, tuberculosis, and traumatism. When due to pneumonia the abscess formation may be single or multiple; if the latter, the purulent collections will be found throughout the lung tissue, both lungs being affected.

During the formation of abscesses in the lungs the patient will experience rigors, hectic fever, rapid pulse, thirst, periods of sweating, and general lassitude; the appetite will be wanting and sleep will be broken by restlessness and pain.

Cough is a troublesome feature of the ailment, much muco-purulent matter being raised in some cases, especially if the abscess forms near the bronchi, eventually breaking into the air-passages. Percussion over the diseased area during the early stages of the pus formation gives a dull sound similar to that obtained in percussing the liver. During and following the formation of purulency the patient's features are pale, and he soon becomes prostrated from the absorption of pus (toxæmia.)

Treatment. In a suspected case of abscess of the lung, where the symptoms are obscure, aspiration is often resorted to as a further aid to a correct diagnosis. This is done at a point in the chest wall that gives off a dullness on percussion. After rendering the skin surface clean in the usual way, make a punctured incision in the integument with a pointed bistoury, through which a long aspirating needle is carefully introduced. If the purulent cavity is found to be near the surface, the punctured wound may be enlarged with the blades of a uterine dressing-forcep, giving free vent to the pent-up pus; following this procedure a rubber drainage tube should be inserted to keep up free drainage. Over the drainage tube and wound ample gauze dressing should be adjusted, and held in place with a few turns of a gauze bandage. In performing the above operation the pleura and lung may be found adhered to the chest wall, as a result of inflammatory action, rendering the work easier and the drainage more complete.

In cases where the abscess is broken into the bronchi, and is afterwards opened up externally, a communication is at once established between the bronchi and the external wound, which will be readily noted by rushing in of air through the external wound during the respiratory movements. If the drainage be defective, and pus finds its way down between the two planes of the pleura, a second opening, made between the ribs at a point lower in the chest walls, will be necessary to evacuate the purulent fluid.

From the onset of the disease the patient's general condition should be looked after. Chills and the hectic flushes will in a measure subside upon opening up the abscess formation. The action of the bowels and kidneys should be kept in a normal state, and the strength of the patient supported with the lime

salts, small doses of strychnia, quinia and iron, and Fowler's solution of arsenic taken an hour after meals.

The diet should be composed of acceptable, nutritious and appetizing dainties, taken at regular intervals and in liberal amounts. The skin should be kept clean with salt baths, and stimulated with an occasional alcohol rub. Complications must be met as they arise.

Better results can be promised from operative work in single abscess than in cases where two or more purulent collections have formed.

EMPYEMA—PYOTHORAX

The term empyema is understood to be a collection of purulent fluid within the pleural cavity, although, technically speaking, it means pus in any cavity; hence, pus may be found entirely inside of the pleural sac and around the outside of the lung and even between the lobes of the respiratory organ.

The causes of empyema may be sepsis, following pneumonia, or an abscess forming in the lung or some adjacent organ, the purulent fluid permeating through into the pleural cavity, and from sepsis following penetrating wounds of the chest walls. The morbid condition is often observed in pleuritic effusion in individuals with a low state of vitality.

The consistency of the purulent fluid is generally thick and creamy, with somewhat of an offensive odor; the latter is always a feature, when the morbid state is due to infection from streptococci. It is then that the pus is thinner and often contains flakes of fibrin. This affection is usually attended with rigors, hectic fever, cough, dyspnea, and night-sweats, indicating vital depression to a greater or less extent. The appetite is generally poor, the function of the bowels irregular, and sleep is disturbed.

When the collection of pus in the pleura is considerable. a bulging of the chest wall will be noted, especially the intercostal spaces. In cases where the toxemia is pronounced, the patient's strength is markedly reduced. As a valuable aid in diagnosis in abscess cases of empyema, a long, slender aspirat-

ing needle should be thrust into the suspected purulent area when, if pus is present, it will escape, unless too heavy to run through the needle. Not infrequently a clot of fibrin will float into the needle and obstruct the escape of the purulent fluid. A slender ,wire pushed through the needle will start the flow afresh.

Treatment: The treatment of empyema should be either by aspirating the fluid away or evacuating it through a small incision in the chest wall over the purulent collection. If the collection of pus is large, the latter is commended. The cavity should be drained, following the incision, using one or two short pieces of soft rubber tubing as the medium, transfixed near the outer end with a safety-pin of suitable size to prevent it slipping into the abscess cavity. Some cases máy discharge a pint or more of pus a day, following the opening of the abscess cavity. With a little precaution in the after dressing, there is little danger of the already infected cavity becoming more intensely necrotic by the entrance of great numbers of septic germs through the drainage tube. In the course of time, the discharge will cease, especially if the general condition of the system be improved with tonics and stimulants and such other remedial agents as will, when administered internally, better the condition of the blood and further promote vital activity.

A common point for making the incision is between the seventh and eighth rib, and not infrequently the nature of the case will be such that a resection of a small portion of one of the ribs will be required to make the clearing of the cavity more easily accomplished. The surgical work can be done under local anæsthesia, except in children and nervous individuals; these should have a few whiffs of chloroform to merely lessen the fear they entertain that they are about to be hurt.

In the majority of acute and subacute cases, the lung will at once expand and fill the cavity, as the purulent fluid is withdrawn. In cases of long standing where the lung, for various reasons, fails to expand to fill the pleural cavity, following the evacuation of pus, it is advised to place the patient in a pneumatic cabinet, where the lung may be forcibly expanded by repeated efforts at forcing inspiration.

To reach the pent-up fluid in most cases of interlobular empyema, the blades of a uterine dressing forcep may be carefully thrust into the cavity, spreading them as they are withdrawn, permitting the pus to readily escape.

ENCEPHALOCELE

When a portion of the brain substance protrudes through a congenital aperture in the skull, enclosed within the meninges, there exists a morbid state known as encephalocele. The tumor is generally observed on the back part of the head, the congenital opening involving the occipital bone.

The symptoms accompanying encephalocele are similar in nearly every respect to those observed in the meningocele, the pathological difference being the protrusion of brain substance in the former in connection with the meninges, while in the latter, the envelopes alone are involved.

Treatment: The treatment advised in meningocele will be applicable in encephalocele, especially the operative measures, when the protruding portion of the brain can be reduced, otherwise the bulging mass should be protected from injury by some form of dressing best suited to the individual case.

ENCEPHALITIS

Inflammation of the brain is of special interest to the surgeon, when it results in abscess formations complicating traumatism and septic meningitis. The morbid state is often extended from the outer surface of the brain to its deeper structure by the transmission of infective material by the lymphatics and venous circulation.

Rigors, fever, restlessness, throbbing pain in the head, wiry frequent pulse, scant secretions, eyes bright, and pupils contracted are many of the early symptoms of the morbid affection and if the disease is not checked in its career and collections of purulent fluid take place within the brain substance, other symptoms of a more serious nature supervene, such as intoler-

ance of light or noise, ringing in the ears, sleeplessness, delirium, with low muttering, pupils dilated, circulation feeble, cool extremities, coma, which, in fatal cases, becomes deeper and more pronounced, finally passing into collapse and death.

, In cases less severe in character, the early symptoms will often improve and finally pass away under proper treatment, the patient recovering within a short time. When death occurs, it is generally due to sepsis. Sub-acute cases often resolve themselves into chronic cerebral abscess, that demand a resort to operative measures to evacuate the purulent fluid, thus placing the patient in a condition to recover. The necessary steps in the operation are fully described in the article on **Brain Abscess**, to which the reader is referred.

Treatment: The medicinal treatment of an acute attack of encephalitis consists of local and general measures. Aconite and gelsemium are usually indicated by the rigors, fever, and restlessness, and increased heat of the head and sensitiveness to light. Pain that is present in the early phases of the disease, will call for rhus, gelsemium, bryonia, or hellebore, associated with aconite or veratrum as the specific indications call for. Bryonia will be indicated by a full vibratile pulse, flushed right cheek and severe shooting pain in the head, being useful after the stage of effusion has set in.

Hellebore is especially indicated where the patient lies much of the time in a stupor, eye-lids partly closed, respiration slow and deep, sudden starting in sleep with screaming; indicated after the acute stage begins to subside.

Rhus is indicated by a sharp stroke of the pulse, tissues about the face contracted, piercing cries during sleep, left side of face mottled with red spots, tongue clean, pointed, with papilla prominent and red.

Belladonna is given often with marked benefit in cases where the patient shows decided indications of cerebral congestion, manifested by the individual remaining much of the time in more or less of a comatose state, features pale, pupils dilated, accompanied with a sluggish capillary circulation.

The bowels should be kept open with the salines or stimulating enemata at the outset, and the function of the kidneys

kept active. The patient should be placed in a cool room and quiet enjoined. The head, in the early stages of the attack, should be kept cool with frequent bathing with ice water. A rubber cap or bag partly filled with pounded ice can be kept on the head most of the time while the inflammatory action is at its height; its effect upon the patient should be carefully watched and discontinued as soon as there is evidence of depression setting in. To equalize the circulation, the lower extremities should be kept warm with hot-water bottles or brick wrapped in flannel and placed between them. Complications must be met with such remedies as are indicated in the individual case.

The diet should consist of soups, broths, milk and water, barley water, egg albumen in water, and later as convalescence sets in, gruel, poached eggs, ice-cream, rice and custards may be taken sparingly.

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